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A Factor Analysis of Motor Ability Variables and Tests, with Tests for College Men

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RESEARCH in motor ability test construction can be classified into three groups of studies: first, those studies dealing with the fundamental elements underlying the performance of the skill, such as accuracy, speed, endurance, control of voluntary movements, agility, balance, body coordination, sensory motor coordination, rhythm, body structure, shiftiness, and strength; second, those studies dealing with the fundamental skills in physical education, such as running, jumping, vaulting, throwing, kicking, climbing, and catching; and third, those studies dealing with physical education sport skills, such as skills in gymnastics, skills in basketball, skills in football, etc. In the first type one is interested in the underlying *causes* or the composition of a skill, in the latter two in the characteristics of the performance itself. The field of chemistry offers an analogy in the relationship of the first classification with the latter two. The chemist is interested in H_2SO_4 because of its many chemical properties, but the chemist is also interested in what the component parts of H_2SO_4 are and the relative proportions of the elements. So it is in motor skills. Research workers are interested in "shooting in basketball" but they are also interested in the component parts of shooting ability and the relative proportions (weighting as in H_2SO_4) of the component parts, or the "basic or fundamental elements." How much is due to accuracy? How much to coordination, etc.? These three approaches constitute the *fundamentals* of test construction in motor skills. One represents the cause (basic elements), the other two the performance or effect (fundamental or sport skills).

The most complete study utilizing the fundamental elements underlying skills approach to the measurement of motor ability is the one conducted by Cozens.[5]* Cozens found a correlation of .97 with seven tests, each designed to measure one of the seven elements of motor ability, and a composite criterion of, motor ability. A high correlation was also found between the Cozens test and the average judgment of five physical education instructors (.97), and he also found that the test clearly differentiated the athletic and the non-athletic groups.

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* Superior figures refer to numbered bibliography at end of article.

Jones [13] analyzed nine tests to determine the "group" and "common" components. His selection consisted of four anthropometric tests and five skills. The study did not propose to analyze the elements of motor skills, but simply to describe the selected tests through an analysis of the intercorrelations.

Gates and Sheffield [9] found that the "change of direction element" is an important factor in game ability.

There have been several studies in motor skills with the purpose of determining the component parts of the various skills. Roulhac [27] analyzed the Cozens test and found four factors: speed, coordination, power, and endurance. Wendler [31] found in analyzing a large number of physical education skills four factors: strength, velocity or speed of movement, motor educability, and sensori-motor coordination. Coleman [3] analyzed eleven skills in terms of four factors (strength, pure speed, dead weight, and height) to determine the composition of the skills. Larson [15] found two factors in analyzing some strength tests (dynamic strength and static dynamometrical strength). Hutto[11] isolated several factors as describing the skills which he selected for his research, namely, strength, weight, muscle velocity, structure, and an arm strength factor. McCloy [18] found in analyzing a number of stunt type tests three factors—strength, velocity, and large muscle coordination. In another experiment McCloy [21] found strength, velocity, and dead weight. Rarick [26] found factors of general strength, velocity, height, arm strength, dead weight, and muscle latency.

Achievement scales have been constructed utilizing the fundamental skills of running, jumping, etc., by Cozens, *et al.*,[4,6,7] and Neilson.[23] Several other studies utilizing both basic fundamental skills and sports skills as a measure of motor ability have been reported.[1,8,22] The latest summary of sport skill tests is by Glassow and Broer.[10]

An excellent logical analysis has been made by McCloy as to the prerequisites to effective learning of motor skills, as well as to the factors in motor educability.[20]

STATEMENT OF PROBLEM

The purposes of this study are: (1) To analyze a number of motor ability tests designed to measure the elements of motor skill for their "primary components." (2) To develop regression equations for the prediction of each primary component and to determine the significance (practical validity) of each combination in terms of a criterion measure of motor ability. (3) To develop a test of motor ability utilizing a criterion measure of motor ability based on the measurement of elements underlying motor skills. (4) To establish a classification scale for the constructed motor ability test. (5) To study the effect of age, height, and weight on ability as demonstrated by use of the constructed test.

LIMITATIONS

There are several limitations of the study. First, the sample is a one-institution sample representing a rather selected group of young men. The sample includes professional and non-professional majors in physical education with the major group in the larger proportion. Second, the tests used for the measurement of the various elements of motor skills are not pure tests, which reduces the validity as described by the statistical results, i.e., the correlations are reduced in value. Third, the constructed test can be used as a classification device when information as to one's ability in the "fundamental elements" is desired. The classification device is not a norm—that is, it does not indicate what "should be" one's ability. Fourth, the constructed tests predict significantly the total level of ability (criterion measure including tests for the various elements) and do not predict each element (endurance, agility, etc.). Fifth, no assurance can be given that all major elements are included in the criterion.

PROCEDURE

Experimental Procedure.—Two samples of Springfield College students were used (major and non-major students in physical education). To the first sample ($N = 156$; 1938–39 college freshmen) 27 test items were administered. These items were selected to measure various elements of motor skills (Table I).* These test items were also used to score several well known tests, namely, Cozens' General Motor Ability Test,[5] Rogers' Strength Test,[24] Rogers' P.F.I.,[25] MacCurdy's Physical Capacity Test,[16] and the Springfield College Strength Test.[15]

To the second sample ($N = 140$; Springfield College freshmen 1939–40), in addition to the tests listed above, several additional tests were administered. These were: Brace Test,[2] Burpee Test,[19] Johnson Test,[12] Side-Step Test,[19] Crisscross Test,[19] and Zigzag Test.[19] It was with the purpose of analyzing the above tests for their common characteristics that they were administered. Every test administered has a logical part as "elements" of motor skills.

Statistical Procedure.—In order to analyze the common characteristics of the various tests, the tests were intercorrelated in each of the two samples. To determine the "primary components," the Thurstone Factor Analysis Method was used.[28, 29, 30] The selection of items for the constructed tests was by aid of the results of the factor analysis and by use of the multiple correlation technique. The items selected were those that significantly represented a "primary component" and that had a significant "net contribution" to the battery. The criterion for selection of items was the minimum number of items to predict the criterion measure of motor ability.

* The classification is entirely arbitrary and has no influence on the statistical results. The relationships determined experimentally are used in final selection of items for the test batteries. This classification was used merely to determine whether the major elements were included in the selection.

RESULTS

Experiment One: Analysis of Tests Designed to Measure the Basic Elements of Motor Ability (Sample One).—The zero-order correlations were calculated for the test items and tests (variables 1-27, tests 28-33, Table II). On the assumption that the *cause* of the correlation between the tests is a common element (variables 1-27), the analysis and further

TABLE I

CLASSIFICATION OF TESTS IN TERMS OF THEIR PREDOMINANT CHARACTERISTICS*

Elements Underlying Motor Skills Performance	Tests Selected to Measure Various Elements
1. Body coordination, agility, and control	Bar snap for distance Bar vault for height Frog stand
2. Muscular Strength	Chinning Dipping Arm pulling force Arm pushing force Floor push-ups Rope climb Left grip Right grip Feet to horizontal bar Half-lever on horizontal bar Leg strength Back strength
3. Arm and shoulder girdle coordination	Shot-put Baseball throw for distance Football pass for distance
4. Motor explosiveness	Vertical jump Standing broad jump Standing hop-step-jump Running broad jump
5. Endurance	440-yard run
6. Shiftiness and change of direction	Dodging run
7. Sensory motor coordination	Football punt for distance
	N = 25

* The classification is the one used by Cozens in part in his analysis of general motor ability (reference No. 5).

statistical calculations and interpretations were made. After studying the table of intercorrelations it was found that some tests have much in common (high correlations), while others are rather unique as far as this selection of tests is concerned. The correlations range from .0 to .85. It was with the purpose of determining which tests tend to cluster that the factor analysis of the intercorrelations was made. On the assumption again that the *reason* for a correlation is something common, the purpose was to determine the common element among test clusters.

The thirty-three test items and test batteries are described by four

factors. The fourth factor residuals were within the limits of the standard error for each test, and it was assumed, therefore, that no other factor existed among these tests.

In a previous study the intercorrelations for a number of strength items or tests were factor analyzed for their primary components.[15]

TABLE II

ROTATED FACTOR LOADINGS (SAMPLE ONE)

Test Items	Factor One	Factor Two	Factor Three	Factor Four	Unrotated h^2	h^2
1. Bar snap	.5880	.1737	−.1428	.0916	.4046	.4044
2. Feet to bar	.5962	.2262	−.2143	.4585	.6628	.6625
3. Half-lever—hor. bar	.5159	.1532	−.1996	.3934	.4843	.4840
4. Bar vault	.6682	.1590	−.1279	−.0456	.4903	.4897
5. Floor push-ups	.5270	.2831	−.1127	.2675	.4421	.4419
6. Rope climb	.4039	.2868	−.2412	−.0026	.3036	.3034
7. Frog stand	.4012	.1607	−.2379	.2890	.3269	.3268
8. Std. bd. jump	.6187	.2595	.1510	−.0566	.4761	.4757
9. Running bd. jump	.4738	.2606	.1045	−.1062	.3146	.3143
10. Std. hop-step-jump	.6069	.1754	.1385	−.1385	.4375	.4371
11. Football punt—dist.	.2859	.1991	.4773	−.1657	.3765	.3767
12. Football pass—dist.	.2425	.4495	.3977	−.1591	.4444	.4443
13. Baseball throw	.3890	.3582	.6199	−.0200	.6643	.6644
14. Shot-put	.2248	.6491	.2235	−.2198	.5701	.5699
15. Dodging run	.3920	.0034	.4367	.0370	.3457	.3457
16. 440-yard run	.5063	.1059	.2632	−.1033	.3475	.3474
17. Rogers' arm strength	.6067	.5297	−.2150	.2235	.7449	.7444
18. Right grip	−.0256	.7372	−.0436	.0593	.5496	.5491
19. Left grip	.1113	.6951	−.0881	.0980	.5130	.5125
20. Strength of back	.1773	.6873	−.0705	.0497	.5113	.5108
21. Strength of legs	.2421	.6396	−.1105	−.0708	.4849	.4755
22. Dips—parallel	.6207	.3399	−.2220	.2413	.6083	.6081
23. Chinning	.7035	.2883	−.1817	.1099	.6231	.6225
24. Vital capacity	−.0580	.5375	.2017	.0241	.3339	.3333
25. Arm pulling force	.1616	.8495	−.1921	.0451	.7869	.7862
26. Arm pushing force	.0962	.6337	−.1192	−.0378	.4265	.4261
27. Vertical jump	.6317	.1591	.0314	−.2395	.4827	.4824
Test Batteries						
28. Cozens' test	.8334	.2521	.5680	.1077	1.0924	1.0920
29. Rogers' S.I.	.6248	.4044	−.3649	−.3119	.7844	.7840
30. Rogers' P.F.I.	.7709	.0873	−.2649	−.0529	.6749	.6744
31. MacCurdy's test	.6292	.2373	−.2825	−.6923	1.0113	1.0113
32. Spfld. S. I.	.8445	.2191	−.1660	−.1636	.8156	.8148
33. Spfld. motor ability test	.7968	.3273	−.0779	.1764	.7792	.7786

Two factors were found, namely, *dynamic strength*, or strength determined by the ability to lift the body weight and propel it upward, and *static dynamometrical strength*, or strength determined by the ability to squeeze, push, pull, or lift as registered on the dynamometer. In this study, utilizing the same strength intercorrelations along with other tests, factor one is again described as *dynamic strength* (Table II). There is further evidence that this is dynamic strength by the fact that variables such as bar snap, feet to the bar, bar vault, standing

TABLE III

MULTIPLE CORRELATION COMBINATIONS FOR THE PREDICTIONS OF EACH FACTOR AND A CRITERION OF MOTOR ABILITY

Factor	Multiple Correlations with Factor*	Standard Score Equations for Prediction of Factor	Prediction of Motor Ability Criterion by Use of Items Selected for Factor Prediction†
Factor one: dynamic strength	$R_{o.(1)(4)(8)(22)(23)(27)} = .8791$ $R_{o.(1)(8)(23)(27)} = .8767$	$Z_o = .3138Z_1 + .1586Z_8 + .4655Z_{23} + .2506Z_{27}$	$R_{o.(1)(4)(8)(22)(23)(27)} = .9907$ $R_{o.(1)(8)(23)(27)} = .9676$
Factor two: static dynamometrical strength	$R_{o.(18)(21)(25)(26)(14)} = .9344$	$Z_o = .3324Z_{18} + .1300Z_{21} + .4263Z_{25} + .1244Z_{26} + .1606Z_{14}$	$R_{o.(18)(21)(25)(26)(14)} = .6974$
Factor three: gross body coordination	$R_{o.(13)(11)(15)(12)} = .6762$ $R_{o.(13)(11)(15)} = .6746$	$Z_o = .4448Z_{13} + .1698Z_{11} + .2254Z_{15}$	$R_{o.(13)(11)(15)(12)} = .5581$ $R_{o.(13)(11)(15)} = .5458$
Factor four: abdominal strength	$R_{o.(2)(3)(5)(7)} = .4788$ $R_{o.(2)(3)} = .4741$	$Z_o = .3525Z_2 + .1607Z_3$	$R_{o.(2)(3)(5)(7)} = .7344$ $R_{o.(2)(3)} = .6582$

* 0=Criterion measure (factor). Numbers refer to tests as numbered in Table II.
† See Table I for composition of motor ability criterion.

broad jump, etc., correlate high with this factor. These findings substantiate the earlier identification as the variables correlating high with the factor are those that require effective utilization of body weight. The second factor is again *static dynamometrical strength.* Substantiation is also given to this identification as ability to squeeze, push, etc.; the instruments do not give evidence as to the ability to handle one's body weight (earlier finding[15]); this is shown by the fact that those tests requiring the effective utilization of body weight *correlate low* with this factor (bar snap .17, standing broad jump .26, etc.) Factor three is identified as *gross body coordination.* Test items such as football kick and pass for distance, and baseball throw for distance are part of this factor. It is, of course, logical to assume that ability in these skills is dependent upon gross body coordination. A person poorly coordinated will not be able to utilize the proper body mechanics for effective results. Factor four is difficult to describe. The items tending to cluster are: feet to the bar and half level on the horizontal bar. Ability in these skills is determined largely by *abdominal strength.* Arm strength correlates with this ability (floor push ups .27, frog stand .29, and arm strength—Rogers formula .22, dips .24) although it appears that abdominal strength is the predominant factor for success.

Regression equations were constructed for the best combination of tests for the prediction of each "primary component" (Table III). The factor loadings were used as zero-order correlations with each factor. The items selected were those giving significant "net" contributions to the factor. The insignificant items were dropped from the battery. For each factor a score form regression equation was calculated (Table III). This equation can be used for the prediction of each ability by changing the raw score into a standard score.

In order to determine the value of each battery of test items used in the prediction of the factor, multiple correlations were calculated using the test items selected for the prediction of each factor, with a criterion measure of motor ability.* The question to be answered is, what is the significance of the factors (dynamic strength, static strength, coordination, and abdominal strength) in terms of a performance criterion of motor ability. The first step in this method indicates the *theoretical* validity (*Rm* with factor), the second indicates the *practical* validity (*Rm* with motor ability criterion) (Table III).

In a previous study it was found that dynamic strength was nearly three times more significant than static dynamometrical strength in predicting a fifteen variable criterion of motor ability.[15] Utilizing a twenty-five variable criterion in this study, dynamic strength is over *two times* more significant than is static strength.

* Twenty-five items were used in the criterion measure (Table I). The zero-order correlations with the criterion are those omitting the item from the criterion being correlated.

Experiment Two: An Analysis of Some Additional Tests Designed to Measure Certain Elements of Motor Ability (Sample Two).—In experiment one, dynamic strength was found to yield the most significant results in predicting the motor ability criterion. It was therefore decided to select three dynamic test items (chinning, dips, and vertical jump) and determine their relationship to a number of other motor ability tests not used in the first experiment. (Brace Test,[2] Johnson Test,[12] Burpee Test,[19] Side-step Test,[19] Criss-cross Test,[19] Zigzag Test.[19]) The intercorrelations of the tests show that they measure several elements of motor ability. A factor analysis of the intercorrelations shows four factors (Table IV). In factor one, the side-

TABLE IV

FACTOR ANALYSIS OF MOTOR ABILITY TESTS (ROTATED FACTOR LOADINGS)
(Sample Two)

Tests	Factor One	Factor Two	Factor Three	Factor Four	Unrotated h^2	Unrotated h^2
1. Dips	.0472	.6840	.3455	−.0084	.5896	.5896
2. Chinning	.0225	.7821	.4057	.0194	.7772	.7768
3. Vertical jump	.2007	.1944	.1479	.4453	.2983	.2980
4. Dodge run	.3731	.2883	.0567	.0926	.2341	.2341
5. Burpee	.2320	.3337	.2579	−.0918	.2400	.2400
6. Brace	.1273	.1708	.6094	.1515	.4398	.4394
7. Johnson	.4025	.1640	.6475	.0043	.6082	.6079
8. Side-step	.6504	.1455	−.0725	−.2427	.5084	.5081
9. Criss-cross	.5652	.0656	.1825	.2703	.4302	.4299
10. Zigzag	.5821	.1559	−.1016	−.0054	.3734	.3734

step, criss-cross, and zigzag tests have significant loadings. The dodge run and the Johnson Test correlate also with this factor. This factor seems to be *gross body coordination and agility*. Chinning and dipping strengths correlate high with factor two. Because the dodge run and the Burpee Test correlate also with this factor, the factor is described as *dynamic strength*. This gives additional evidence to the presence of such a quality. The Brace and Johnson Tests have the highest correlations with factor three, with some correlation with chinning and dipping strength. Because of the complexity of the Brace and Johnson Tests(each includes a number of stunt type tests), it is difficult to describe this factor. There is some evidence for these tests as tests of motor educability.[14] This factor is therefore tentatively described as *motor educability*. The vertical jump and criss-cross tests have significant loadings with factor four. Both of these tests require the use of the body weight in a force-time relationship. This factor is therefore described as *motor explosiveness*.

In order to have some experimental evidence as to the validity of the four factors, comparisons were made between ability as expressed by each of the factors, with ability in a thirteen-variable criterion of

motor ability.* Combinations were made among all significant factor loadings, but it was found that the description of each factor was adequately made by the tests having the highest loadings (see Table V). These findings add to the significance of the identification of the four factors. All of the factors are significantly related to motor ability. Factor I, or Gross Body Coordination and Agility, correlates .44; Factor II or Dynamic Strength, .57; Factor III (motor educability) .48; and Factor IV (motor explosiveness) .53 (see Table V). These findings give additional factors to those found in "experiment one" (motor explosiveness and motor educability).

TABLE V

MULTIPLE CORRELATION COMBINATIONS FOR THE PRODUCTION OF EACH FACTOR AND A CRITERION OF MOTOR ABILITY

Factors	Multiple Correlations with Factor*	Prediction of Motor Ability Criterion by Use of the Items Selected for Factor Prediction†
Factor one: *gross body coordination and agility*	$R_{0.4789(10)} = .8183$ $R_{0.89(10)} = .8060$	$R_{0.89(10)} = .4401$
Factor two: *dynamic strength*	$R_{0.1245} = .8113$ $R_{0.12} = .8036$	$R_{0.12} = .5678$
Factor three: *motor educability*	$R_{0.12567} = .7353$ $R_{0.67} = .7314$	$R_{0.67} = .4780$
Factor four: *motor explosiveness*	$R_{0.39} = .4731$	$R_{0.39} = .5326$

* 0=criterion measure (factor). Numbers refer to tests in Table IV.
† See Table I for the composition of the motor ability criterion.

TEST CONSTRUCTION (Sample One)

One of the major purposes of this research was to utilize the information secured from the comprehensive statistical analysis of the motor ability tests to construct an *indoor test* and an *outdoor test* which would effectively predict total motor ability as described by the criterion measure used. Test users are usually not able to administer long, complex tests. It was therefore with the thought of simplicity with maximum validity that items were selected for the two tests.

The criterion measure used to evaluate each test item consisted of a number of tests designed to measure the various elements underlying motor skills. These elements and tests designed to measure them are listed in Table I. Each test item was correlated with the criterion

* Criterion included tests designed to measure various elements of motor ability. It is recognized that all the elements are not included. The tests are: bar snap, feet to bar, bar vault, rope climb, standing broad jump, running broad jump, standing hop-step-jump, football punt for distance, baseball throw for distance, shot-put, dodge run, 440-yard run, football pass for distance.

measure (twenty-five variables minus variable correlated) to determine the significance in predicting the criterion (Table VI). The items selected for the two batteries were the result of (1) the factor analysis of the table of intercorrelations (Table II), (2) the criterion correlations (Table VI), and (3) the intercorrelations of the various tests. It was the purpose to predict the criterion measure to the highest degree of efficiency. The test items selected, therefore, could not be duplicates but should represent a unique ability. The above steps represent the method for such selection.

TABLE VI

CRITERION CORRELATIONS: CORRELATION OF TEST ITEMS WITH THE CRITERION MEASURE OF MOTOR ABILITY

Test Items	Criterion Correlations	Multiple Combinations
1. Bar snap	.7723	
2. Dips	.7055	
3. Chinning	.6965	Cozens' General Motor Ability Test = .9921
4. Standing broad jump	.6803	
5. Feet to the bar	.6469	
6. Arm pulling force	.6137	$R_{o}.(16)\ (1)\ (3)\ (9)\ (5) = .9842$
7. Floor push-ups	.6093	
8. Bar vault	.6077	$R_{o}.(16)\ (1)\ (4)\ (2) = .9858$
9. Vertical jump	.6062	
10. Running broad jump	.5851	$R_{o}.(16)\ (1)\ (4)\ (3)\ (9) = .9924$
11. Arm pushing force	.5514	
12. Shot-put	.5505	$*R_{o}.(16)\ (1)\ (3)\ (9) = .9804$
13. Rope climb	.5472	
14. Std. hop-step-jump	.5247	$\dagger R_{o}.(1)\ (25)\ (2)\ (3)\ (9) = .9687$
15. Half-lever (hor. bar)	.5183	
16. Baseball throw for distance	.5179	$R_{o}.(1)\ (4)\ (3)\ (9) = .9676$
17. Strength of legs	.5024	
18. Left grip	.4890	$R_{o}.(1)\ (8)\ (4)\ (2)\ (3)\ (9) = .9907$
19. Strength of back	.4883	
20. Football pass for distance	.4376	$R_{o}.(16)\ (24)\ (1)\ (4)\ (2)\ (22) = .9914$
21. Right grip	.4165	
22. 440-yard run	.4079	$R_{o}.(16)\ (24)\ (1)\ (4)\ (2) = .9887$
23. Frog stand	.3820	
24. Football punt for distance	.3494	
25. Dodging run	.3383	

* Selected as outdoor battery.
† Selected as indoor battery.

For the indoor test of motor ability, the combination of the dodge run, bar snap, chinning, dipping, and vertical jump was selected. This combination predicts the criterion measure to a very high degree of accuracy (.9687). The outdoor test consists of the baseball throw for distance, chinning, bar snap, and vertical jump. This combination is also highly valid (.9804) on the basis of the criterion measure used in this study.

The reliabilities of the test items and index scores of the two tests

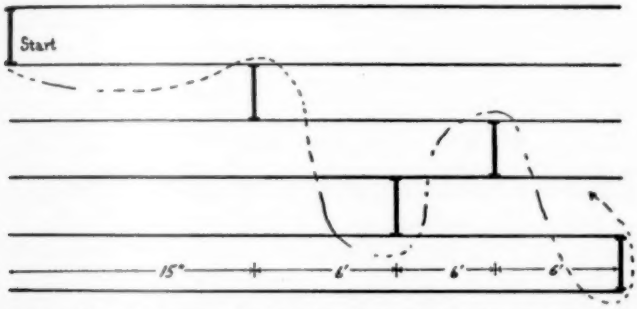
are all .86 and above.* This means that if the directions are carefully followed and great care is taken in administering the tests, the first score very significantly approximates the true score for the individual.

ADMINISTRATION OF TEST

Directions for Conducting Tests

1. Indoor Test

Dodging Run†—Five parallel lanes are constructed, 3′ wide and 11 yards long. Five low hurdles or some other object of similar nature are placed in the first, second, fourth, third, and fifth lanes (see Fig. 1). The runner starts at the starting point and runs as indicated by the dotted line. The time necessary for *two complete* runs is the score. Regulation gymnasium equipment should be used. The subject should not touch the hurdles when circling them.



Bar Snap.—The horizontal bar is placed at 4′ 6″. Mats should be placed on floor for landing. The subject stands close to the bar, grasping it, then swings underneath shooting the feet close to the bar and upward. The back should be arched, and the subject should drop the bar when sufficient height has been reached for the best distance. The distance from the plane of the horizontal bar to the maximum distance (back heels) is the score (three trials). Practice should be allowed so as to develop the skill necessary for this test. The subject is *not allowed* to jump before the underswing, but must start with feet on the floor.

Chinning (ten-minute rest between dips and chinning).—Use horizontal bar at such height that subject's feet do not touch the floor when subject is in lowered position. Subject can use either the forward or reverse grip. To begin, the subject hangs from the bar, then pulls himself up until his chin is over the bar, then lowers himself until arms are straight. The subject is not permitted to kick, to swing, or to rest. Partial chins do not count. The count is one for each full chin.

Dips.—The subject jumps to an arm rest position at the end of the parallel bars (bars at shoulder height), with arms fully extended. From this

*$N = 138$; baseball throw for distance .8936; bar snap .9280; chinning .8719; dipping .9024; vertical jump .8653; outdoor test .9333. The reliability experiment was conducted under ordinary experimental conditions in administering tests.

† Test devised by Cozens and used in his *General Motor Ability Test*—See reference 4. Used by permission of the publishers.

TABLE VII

Scoring Table—Indoor Test

Dodging Run (Wt.= 1.09)			Bar Snap (Wt. = 4.05)			Dipping (Wt. = 1.60)			Chinning (Wt. = 2.73)			Vertical Jump (Wt. = 1.00)		
Raw Score (Sec.)	T-Score	Wtd. T-Score	Raw Score (Sec.)	T-Score	Wtd. T-Score	Raw Score	T-Score	Wtd. T-Score	Raw Score	T-Score	Wtd. T-Score	Raw Score (Ins.)	T-Score	Wtd. T-Score
28.0	27	29	20.6	66.8	73	102	80	324	65	59.3	240	23	80	128	23	80	218	26.0	78	78
27.8	28.2	31	20.4	68.2	74	101	79.3	321	64	58.7	238	22	78	125	22	78	213	25.5	76	76
27.6	29.4	32	20.2	69.6	76	100	78.7	319	63	58	235	21	76	122	21	77	210	25.0	74	74
27.4	30.6	33	20.0	71	77	99	78	316	62	57.3	232	20	73	117	20	76	207	24.5	72	72
27.2	31.8	35	19.8	72.2	79	98	77.3	313	61	56.7	230	19	71	114	19	75	205	24.0	70	70
27.0	33	36	19.6	73.4	80	97	76.7	311	60	56	227	18	70	112	18	73	199	23.5	68	68
26.8	34	37	19.4	74.6	81	96	76	308	59	55.3	224	17	69	110	17	71	194	23.0	66	66
26.6	35	38	19.2	75.8	83	95	75.5	306	58	54.7	222	16	67	107	16	69	188	22.5	64	64
26.4	36	39	19.0	77	84	94	75	304	57	54	219	15	64	102	15	67	183	22.0	62	62
26.2	37	40				93	74.5	302	56	53.3	216	14	62	99	14	65	177	21.5	60.5	61
26.0	38	41				92	74	300	55	52.7	213	13	60	96	13	63	172	21.0	59	59
25.8	38.8	42				91	73.5	298	54	52	210	12	58	93	12	60	164	20.5	57.5	58
26.6	39.6	43				90	73	296	53	51.2	207	11	56	90	11	58	158	20.0	56	56
25.4	40.4	44				89	72.5	294	52	50.3	204	10	54	86	10	55	150	19.5	54	54
25.2	41.2	45				88	72	292	51	49.5	200	9	52	83	9	52	142	19.0	52	52
25.0	42	46				87	71.5	290	50	48.7	197	8	50	80	8	50	137	18.5	50.5	51
24.8	42.8	47				86	71	288	49	47.8	194	7	47	75	7	48	131	18.0	49	49
24.6	43.6	48				85	70.5	286	48	47	190	6	45	72	6	45	123	17.5	47	47
24.4	44.4	48				84	70	284	47	46	186	5	43	69	5	42	115	17.0	45	45
24.2	45.2	49				83	69.5	281	46	45	182	4	41	66	4	40	109	16.5	43.5	44
24.0	46	50				82	69	279	45	44	178	3	38	61	3	37	101	16.0	42	42
23.8	47.2	51				81	68.5	277	44	43	174	2	35	56	2	34	93	15.5	40	40
23.6	48.4	53				80	68	275	43	42	170	1	30	48	1	30	48	15.0	38	38
23.4	49.6	54				79	67.5	273	42	41	166	0	24	38	0	27	74	14.5	36.5	37
23.2	50.8	55				78	67	271	41	39.7	161							14.0	35	35
23.0	52	57				77	66.5	269	40	38.3	155							13.5	33	33
22.8	53.2	58				76	66	267	39	37	150							13.0	31	31
22.6	54.4	59				75	65.5	265	38	35.7	145							12.5	29	29
22.4	55.6	61				74	65	263	37	34.3	139							12.0	27	27
22.2	56.8	62				73	64.5	261	36	33	134							11.5	25.5	26
22.0	58	63				72	64	259	35	31.5	128							11.0	24	24
21.8	59.2	65				71	63.3	256	34	30	122									
21.6	60.4	66				70	62.7	254	33	28.5	115									
21.4	61.6	67				69	62	251	32	27	109									
21.2	62.8	68				68	61.3	248	31	25.5	103									
21.0	64	70				67	60.7	246	30	24	97									

position the subject lowers his body to a right angle arm bend position and pushes up to the first position. The subject is not permitted to rest in any position, to swing or to kick. Partial dips do not count. The count is one for the jump into the first position, then one for each full dip.

Vertical Jump.—The preferred equipment for the measurement of the vertical jump is the MacCurdy Vertical Jump-meter.[16] If this equipment is not available the well known jump-and-reach method is used. A blackboard or cloth is placed on the wall high enough to record the reach and the best jump. The subject is asked to stand as close to the wall (face toward wall) as possible with both arms upstretched, with feet flat on the floor. A chalk mark is made of this maximum reach at tip of fingers for each hand. A line is then drawn between the two points. The subject then stands sideways with right or left arm close to the wall. Chalk dust is placed on the middle finger. The subject jumps, throwing both arms upward, recording height with the hand near the wall. The difference between maximum reach and maximum jump is recorded to the nearest half-inch. The best one of three trials is selected.

2. Outdoor Test

Baseball Throw for Distance.—A twelve-inch inseam ball is used. The subject is allowed to run to the throwing line, but must not overstep the line. The field is marked at five-foot intervals to facilitate measurement. The examiner estimates the distance between markers when the ball hits the ground. A warm-up period should be allowed and the best throw of three trials selected for the score. The measurement is recorded in feet.

Chinning.—See directions for indoor test.

Bar Snap—See directions for indoor test.

Vertical Jump.—See directions for indoor test.

Scoring and Classification

Indoor Test.—

1. Change raw scores into "weighted standard scores," Table VII.
2. Sum the "weighted standard scores." This is the "index score."
3. Determine classification, Table VIII.

Outdoor Test.—

1. Change raw scores into "weighted standard scores," Table IX.
2. Sum the "weighted standard scores." This is the "index score."
3. Determine the classification, Table X.

APPLICATION OF TESTS

The two tests indicate in a highly valid way (.9687; .9804) the achievement on a number of tests designed to measure the various elements underlying motor skills. Both tests, therefore, indicate equally well "total achievement" of motor ability (as described by 25 test items used in criterion), utilizing the "basic elements" for its measurement. The tests should be used with this understanding. They will not indicate achievement in sport skills such as basketball, baseball, etc. They simply indicate one's standing in "elements" underlying sport skills.

TABLE IX

Scoring Table—Outdoor Test

Baseball Throw (Wt. = 2.23)								
Raw Score (Ft.)	T-Score	Wtd. T-Score	Raw Score	T-Score	Wtd. T-Score	Raw Score	T-Score	Wtd. T-Score
270	80	178	196	56.8	127	122	32.6	73
268	79.6	178	194	56.2	125	120	32	71
266	79.2	177	192	55.6	124	118	31.6	70
264	78.8	176	190	55	123	116	31.2	70
262	78.4	175	188	54.2	121	114	30.8	69
260	78	174	186	53.4	119	112	30.4	68
258	77.8	173	184	52.6	117	110	30	67
256	77.6	173	182	51.8	116	108	29.6	66
254	77.4	173	180	51	114	106	29.2	65
252	77.2	172	178	50.2	112	104	28.8	64
250	77	172	176	49.4	110	102	28.4	63
248	76	169	174	48.6	108	100	28	62
246	75	167	172	47.8	107	98	27.4	61
244	74	165	170	47	105	96	26.8	60
242	73	163	168	46.4	103	94	26.2	58
240	72	161	166	45.8	102	92	25.6	57
238	71.2	159	164	45.2	101	90	25	56
236	70.4	157	162	44.6	99	88	24.8	55
234	69.6	155	160	44	98	86	24.6	55
232	68.8	153	158	43.4	97	84	24.4	54
230	68	152	156	42.8	95	82	24.2	54
228	67.2	150	154	42.2	94	80	24	54
226	66.4	148	152	41.6	93	78	23	51
224	65.6	146	150	41	91	76	22	49
222	64.8	145	148	40.4	90	74	21	47
220	64	143	146	39.8	89	72	20	45
218	63.2	141	144	39.2	87	70	19	42
216	62.4	139	142	38.6	86			
214	61.6	137	140	38	85			
212	60.8	136	138	37.4	83			
210	60	134	136	36.8	82			
208	59.6	133	134	36.2	81			
206	59.2	132	132	35.6	79			
204	58.8	131	130	35	78			
202	58.4	130	128	34.4	77			

Chinning (Wt. = 3.66)		
Raw Score	T-Score	Wtd. T-Score
23	80	293
22	78	285
21	77	282
20	76	278
19	75	275
18	73	267
17	71	260
16	69	253
15	67	245
14	65	238
13	63	231
12	60	220
11	58	212
10	55	201
9	52	190
8	50	183
7	48	176
6	45	165
5	42	154
4	40	146
3	37	135
2	34	124
1	32	117
0	27	99

Bar Snap (Wt. = 4.91)					
Raw Score (Ins.)	T-Score	Wtd. T-Score	Raw Score	T-Score	Wtd. T-Score
102	80	393	65	59.3	291
101	79.3	389	64	58.7	288
100	78.7	386	63	58	285
99	78	383	62	57.3	281
98	77.3	380	61	56.7	278
97	76.7	377	60	55	275
96	76	373	59	55.3	272
95	75.5	371	58	54.7	269
94	75	368	57	54	265
93	74.5	366	56	53.3	262
92	74	363	55	52.7	259
91	73.5	361	54	52	255
90	73	358	53	51.2	251
89	72.5	356	52	50.3	247
88	72	354	51	49.5	243
87	71.5	351	50	48.7	239
86	71	349	49	47.8	235
85	70.5	346	48	47	231
84	70	344	47	46	226
83	69.5	341	46	45	221
82	69	339	45	44	216
81	68.5	336	44	43	211
80	68	334	43	42	206
79	67.5	331	42	41	201
78	67	329	41	39.7	195
77	66.5	327	40	38.3	188
76	66	324	39	37	182
75	65.5	322	38	35.7	175
74	65	319	37	34.3	168
73	64.5	317	36	33	162
72	64	314	35	31.5	155
71	63.3	311	34	30	147
70	62.7	308	33	28.5	140
69	62	304	32	27	133
68	61.3	301	31	25.5	125

Vertical Jump (Wt. = 1.00)		
Raw Score (Ins.)	T-Score	Wtd. T-Score
20.0	78	78
25.5	76	76
25.0	74	74
24.5	72	72
24.0	70	70
23.5	68	68
23.0	66	66
22.5	64	64
22.0	62	62
21.5	60.5	61
21.0	59	59
20.5	57.5	58
20.0	56	56
19.5	54	54
19.0	52	52
18.5	50.5	51
18.0	49	49
17.5	47	47
17.0	45	45
16.5	43.5	44
16.0	42	42
15.5	40	40
15.0	38	38
14.5	36.5	37
14.0	35	35
13.5	33	33
13.0	31	31
12.5	29	29
12.0	27	27
11.5	25.5	26
11.0	24	24

The tests therefore can be used for classification purposes in physical education. Those standing high in the "basic elements" should be placed together whether or not they have mastered the sport skills to be taught. Those high in the tests will progress rapidly if they stand high in the particular element called for in the sport skill. The tests do not predict or indicate specific basic abilities, such as endurance, coordination, etc. All that is known is that these two tests contain enough in common with the criterion measure to predict it to a very high degree. It is of real interest to determine the reasons for the relationship, but for practical purposes the tests can be used as classification devices in the teaching of physical education skills.

TABLE VIII

CLASSIFICATION SCALE FOR INDOOR TEST OF MOTOR ABILITY
(College Men)

Decile Values		Classification Scale	
		Score Values and Classification (sigma units)*	
		630–up	Excellent
90	620		
80	588	558–629	Good
70	561		
60	539		
50	526	486–557	Average
40	499		
30	482		
20	460	414–485	Poor
10	440		
		413–down	Very Poor

* Percentage of frequencies (Normal Curve) in each classification:

Excellent = 6.45 (1.5σ)
Good = 24.17 (1.0σ)
Average = 38.30 (1.0σ)
Poor = 24.17 (1.0σ)
Very Poor = 6.45 (1.5σ)

$M = 521.56$
$\sigma = 72.01$
$N = 295$

NORMS

The question "what should be" one's motor ability is a difficult research problem. There are many factors to be taken into consideration in building norms. In order to eliminate all advantages so that comparison can be made in respect to the ability alone, one must have information concerning all functional and structural mechanisms of the body so as to "hold constant" if the ability is to be evaluated. The question as to how important are the various mechanisms in terms of motor ability is a problem for research. Age, height, and weight have been correlated with motor ability and found to be significant. Cozens, *et al.*,[7] and McCloy[17] have developed equations for homogeneous grouping with respect to age, height, and weight.

Age, height, and weight rectilinear and curvilinear correlations have been calculated for the two tests (indoor or outdoor) developed in this research, using the index scores (Table XI). The correlations (eta) are significant enough to consider when norms are constructed for the two tests. Further research is necessary, evaluating other items, before norms can be presented.

The two tests can be used for classification purposes in physical education without norms. It should be remembered that the scores simply indicate present achievement, and that they should not be interpreted as to "what should be" individual achievement.

CONCLUSIONS

1. Two types of tests have been presented in this research, first, tests to be used for research purposes, and second, two tests (indoor and

TABLE X

CLASSIFICATION SCALE FOR OUTDOOR TEST OF MOTOR ABILITY
(College Men)

Decile Values		Classification Scale	
		Score Values and Classification (sigma units)*	
		728–up	Excellent
90	710		
80	677	642–727	Good
70	645		
60	619		
50	598	556–641	Average
40	574		
30	551		
20	524	470–555	Poor
10	490		
		469–down	Very Poor

* Percentage frequencies (Normal Curve) in each classification:
Excellent = 6.45 (1.5σ)
Good = 24.17 (1.0σ)
Average = 38.30 (1.0σ)
Poor = 24.17 (1.0σ)
Very Poor = 6.45 (1.5σ)

$M = 599.20$
$\sigma = 85.82$
$N = 432$

TABLE XI

AGE, HEIGHT, WEIGHT CORRELATIONS WITH MOTOR ABILITY TESTS

Variables	Indoor Test	Outdoor Test
Age	$r =$ .1149 eta = .2492	$r =$ .0993 eta = .1634
Height	$r =$ .0696 eta = .2022	$r =$ .0430 eta = .2506
Weight	$r =$ -.2105 eta = .3207	$r =$ -.0735 eta = .2359

outdoor) which can be used by physical education teachers for homogeneous classification.

2. The research tests are designed to measure some of the elements underlying ability in motor skills. The raw scores must first be changed to standard scores before the equations can be used. The equations are:

a) *Dynamic Strength:* $Z_0 = .3138$ (bar snap) + .1586 (standing broad jump) + .4655 (chinning) + .2506 (vertical jump)
b) *Static Dynamometrical Strength:* $Z_0 = .3324$ (right grip) + .1300 (strength of legs) + .4263 (arm pulling force) + .1606 (shot-put)
c) *Gross Body Coordination:* $Z_0 = .4448$ (baseball throw for distance) + .1698 (football punt for distance) + .2254 (dodging run)
d) *Abdominal Strength:* $Z_0 = .3525$ (feet to bar) + .1607 (half-lever on horizontal bar)

3. The indoor and outdoor tests are equally valid and indicate to a very high degree a twenty-five variable motor ability criterion used in this research ($R_{\text{indoor}} = .9687$, $R_{\text{outdoor}} = .9804$). The indoor test consists of : dodging run, bar snap, chinning, dipping, and vertical jump; the outdoor test: baseball throw for distance, chinning, bar snap, and vertical jump.

4. The addition of the dodging run and bar snap increased the validity of the Springfield Strength Test (chinning, dipping, and vertical jump), developed in another research (.82 to .96). It is desirable, however, to have both tests.

5. The two tests developed (indoor and outdoor) can be used for classification purposes in physical education classwork, but they do not predict sport skills. They are valuable only in that they indicate ability in the basic elements underlying sport skills. It is desirable when teaching sport skills to keep this ability homogeneous.

6. Classification devices are presented for both tests, but further study is necessary in order to present norms.

7. Factor analyses of two samples from the same population but including different tests (all designed to measure "elements" of motor skill ability) resulted in the following factors: dynamic strength, static dynamometrical strength, gross body coordination and agility, motor educability, motor explosiveness, and abdominal strength.

8. This study verifies Cozens' research in the development of his test of general motor ability for college men ($R_m = .9921$).

9. Further evidence is presented to substantiate an earlier identification by the author of a *dynamic strength factor* and a *static strength factor* in strength tests. The motor ability tests correlate high with dynamic strength and comparatively *low* with *static* strength.

Acknowledgment.—The writer wishes to acknowledge help in the statistical computations from Mr. Herleik Quamme and Mr. Robert Bruce, Graduate Assistants in Tests and Measurements.

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The Measurement of Postures

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THE lack of a convenient and reliable means of making or recording observations has been a serious handicap both in the study and in the teaching of posture. The silhouettograph requires expensive equipment, is slow in operation, and the results as recorded are not readily understandable by the uninitiated. But it remains the only method of preserving a record or of expressing results in a manner by which comparisons may be made with any degree of accuracy.

When this equipment is not available, the teacher or examiner has been limited to the expression of an opinion and, no matter how skilled the observer, words do not express this opinion with sufficient accuracy to be entirely satisfactory to the examiner, to form a reliable record for comparisons, or to form a basis of discussion among different observers.

Postural difficulties may be either organic, including those due to bony malformation and the various muscular atrophies resulting from disease or other trauma, or functional. The correction of organic postural difficulties, while at least partially possible, is a slow and highly individualized procedure. But a very large proportion of the functional bad postures are merely habitual and quite easily correctible if intelligently and consistently treated.

By far the largest group of the functional bad anteroposterior postures occurs in the region above the waist, i.e., they involve the dorsal and cervical regions. This fact is of special importance to teachers of physical education who are dealing with adolescents in groups too large to permit detailed individual attention. But these same adolescents are the ones most likely to respond to group exercises and to benefit from the development of a posture consciousness.

Since the time element is a serious handicap to the use of the silhouettograph for large groups even when the apparatus is available, a measuring instrument was devised which is inexpensive, rapid in use, and easily portable and which gives a reading simple to record, easy to understand, in numerals which will impress the student, and sufficiently accurate to measure the improvement in the posture of a given individual even though it might not give readings which would permit the setting up of standards or of comparing one individual with another.

The theory involved may be understood by reference to Figure I. If

we assume a base line *AB* passing through the chest in an anteroposterior direction at the level of the ensiform cartilage, the apex of the thoracic angle, or the middle of internipple line, and from its anterior end draw a line *BC* to any fixed point on the head, the tip of the nose for instance, it will give an angle at B of from about 75° to about 100°. For reasons which will appear later it has been found advisable to construct and calibrate the instrument in such a manner as to read the angle *A'BC* rather than the angle *ABC*.

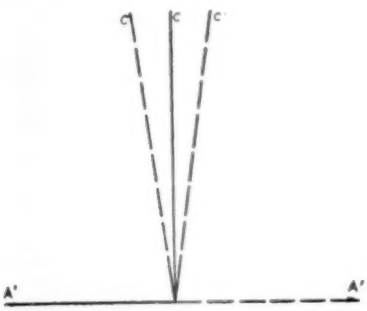


FIGURE 1.

As the point *C* moves backward or as the point *B* moves forward or upward, the angle *A'BC* will increase. The application of this principle to the measurement of posture is based on the fact that as the posture of the thoracic region improves, the chest moves forward and upward and the head moves backward both thus tending to increase the angle *A'BC*. This angle we have called the postural angle and have designated it as $p°$.

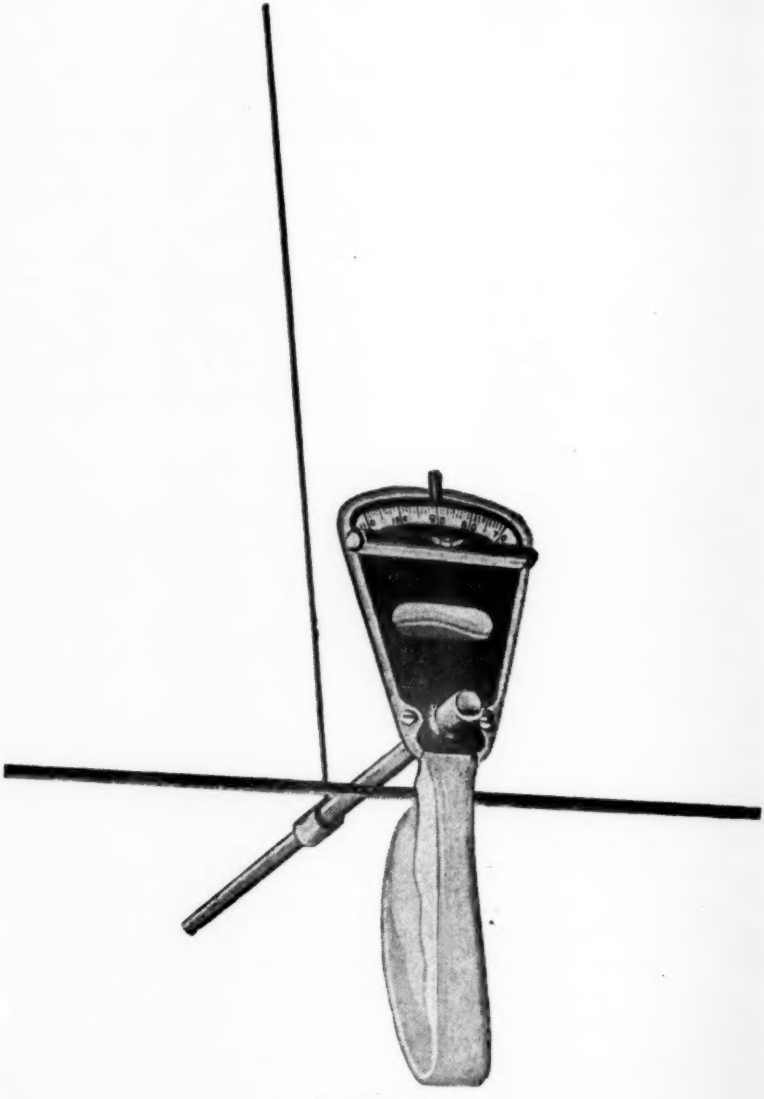
THE POSTUREMETER

The instrument, which we have called the Posturemeter, consists essentially of a protractor, a level to assure that the 90° graduation is perpendicular, and a movable finger or cursor to connect the anterior point of the horizontal anteroposterior line through the body (line *AB*) with the fixed point *C* on the head (in this case the tip of the nose). This finger is so arranged in relation to the protractor as to give the measurement in degrees of the angle *A'BC*. When the middle of the internipple line is to be used as point *B*, the instrument is fitted with a horizontal cross arm to facilitate the determination of the point *B* and the instrument is so designed that the measuring edge of the moving finger is in alignment with the center of the cross arm and with the center of rotation of the hub of the finger.

The protractor is so arranged that it reads from right to left that is, the angle *A'BC*, for the reason that the readings will then conform very closely to percentage figures commonly used in recording class standings. Thus a reading of 75° would indicate very bad posture—the worst that was found in 1,110 examinations, 90° would represent fair and 100° would represent the best posture found in our series of 1,110 examinations.

In devising the instrument for measuring the postural angle the preferable location of point *B* was a matter of considerable study. The

two most promising points were either the tip of the ensiform cartilage or the center of the internipple line. The center of the internipple line was finally chosen for purely practical rather than for scientific reasons. The tip of the ensiform is a more definitely fixed point when the chest is at rest, but it is more difficult to locate with accuracy or dispatch. Also its excursion during respiration is so wide that in order to secure



The Posturemeter

comparable results it would be necessary to be sure that the chest was always at the same phase of its excursion when the readings were taken.

The internipple line is very definite, but in girls it may move as the breast develops. It was considered, however, that as the bust grew larger the nipple, while being displaced forward, would also tend to ride lower on account of the increased weight. These two changes in position will tend to offset each other so far as the arc of the postural angle is concerned. Another consideration was that in girls having any material bust development, the rod placed against the softer bust would be less affected by the respiratory excursion than if the base point *B* were taken from the more rigid ensiform cartilage. Measurements made over street clothes or brassiere are not reliable as the presence of either renders location of the nipples difficult and inaccurate and a brassiere by its lifting action results in a very inaccurate reading.

It is possible, but not yet demonstrated, that unusually large busts might introduce an error so far as comparisons with individuals having little or no such development are concerned. This does not, however, affect the value of successive measurements of the same individual for the purpose of recording improvement or regression. It is also theoretically probable that the large-busted girl actually does have a better cervico-dorsal posture due to her automatic compensation of her center-of-gravity line.

This objection is no more valid than would be an objection to the application of the same percentage system in the grading of academic subjects in which there is an even greater variation of the abilities of different students. Likewise, it does not apply in the case of boys, nor, in the high school ages, to a very large number of girls.

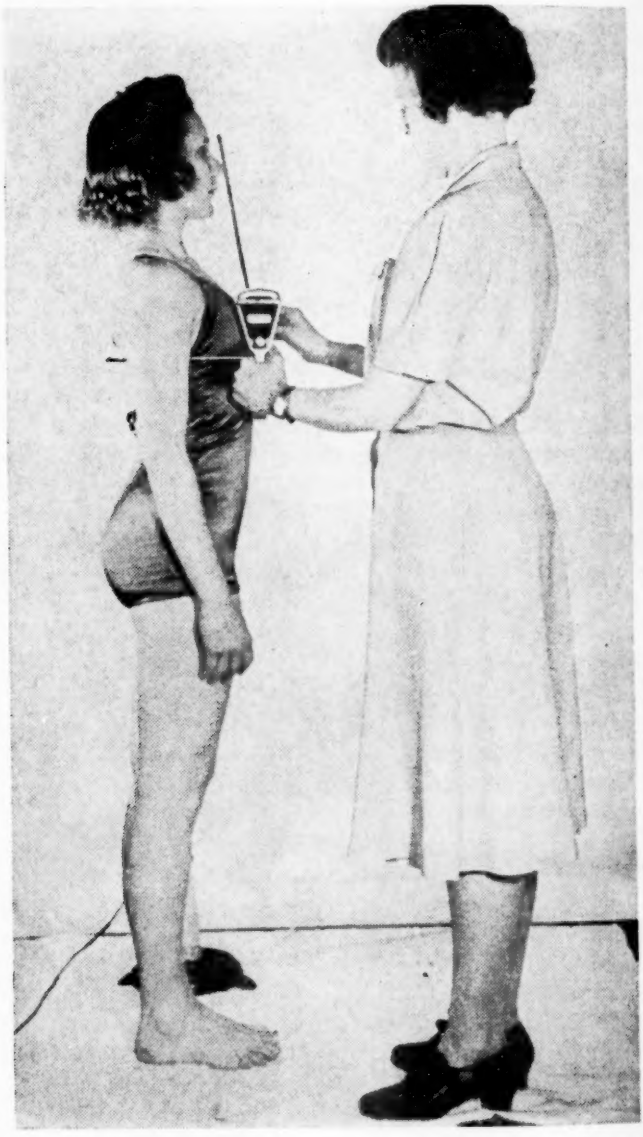
Other regions for the measurement of the deviations which have been considered are: the umbilicus to the most prominent point of the skin over the sternum; the middle of a line connecting the tips of the scapulae, to the most prominent point on the back of the head; and either the apex or the middle of the base of the sacral triangle, or of a line connecting the crests of the ilia, to the most prominent point in the dorsal curve. The practicability of using these regions has not yet been investigated as the original technic has yielded such consistent results that it has been thought wise to exhaust its possibilities before changing the technic.

It is realized that there are several types of postural defects that may introduce errors if this instrument is used without discrimination, in that the subjects may appear to have poor postures and still yield measurements of 90° or more, indicating "good" or "very good" postures. Prominent among these are:

1. Prominent scapulae which distort the general appearance, but do not affect the position of the spine.

2. Large deposits of tissue over the 7th cervical area.

3. The excessively elongated curve of the lumbar spine including the lower thoracic vertebrae due to contraction of the erector spinae group often found in those who are making a conscious effort to stand straight.



The technique of posture measurement

OBSERVATIONS

The Department of Physical Education in the Carl Schurz High School gave us the opportunity to measure and make records on 1,110 girls between the ages of 13 and 19 during the last 6 months, and to

Leveling of Posturemeter, with index rod not yet in contact with nose. When made, this reading was 85°.

This reading of 97° indicates "very good" posture.

make a second measurement after a 6-week interval on 353 of the group. The opportunity to make comparable measurements on boys has not yet presented itself.

After the first posture reading was taken, the groups analyzed good posture and were taught to assume a good standing position. One exercise was given them to be done out of class daily during the interval between the first and the second measurements. This exercise was as follows: Standing or sitting—place the palms of the hands on the sides of the rib cage, spread the ribs out to the side against the hands as far as possible, hold this position and breathe five to six times without moving the ribs. Relax and repeat ten or fifteen times daily. This increases the subcostal angle, develops a localized or kinesthetic control of the intercostals, lifts and spreads the ribs, flattening the middle and back and moving the head back as the cervical spine compensates or alters its position in relation to the dorsal spine. It provides a simple, tangible, conscious method of correcting malalignment of the head, chest, and shoulder girdle, which in turn is followed by compensatory changes in the lower back and abdomen.

Table I gives a comparison of the first and second measurements of

TABLE I

COMPARISON OF POSTURE ANGLES BEFORE AND AFTER TRAINING, ANALYZED BY AGE GROUPS

	13 yrs.		14 yrs.		15 yrs.		16 yrs.		17 yrs.		18 yrs.		19 yrs.	
p°	1st exam.	2nd exam.	1st exam.	2nd exam.	1st exam.	2nd exam.	1st exam.	2nd exam.	1st exam	2nd exam.	1st exam.	2nd exam.	1st exam.	2nd exam.
100	0	1	0	1	0	0	0	0	0	1	0	0	0	0
99	0	1	0	0	0	0	1	0	0	0	0	1	0	1
98	0	5	0	3	0	0	0	0	0	4	0	0	0	0
97	0	1	1	0	0	0	0	4	3	6	0	0	0	1
96	0	4	1	5	0	1	2	3	2	4	1	0	0	0
95	2	5	1	23	0	3	1	4	7	22	1	1	1	1
94	0	2	2	9	0	4	1	8	5	18	0	6	0	0
93	5	1	6	9	0	6	1	7	7	16	1	3	1	0
92	2	3	7	12	3	4	1	5	5	12	1	3	0	0
91	4	2	9	9	1	2	3	0	13	19	0	2	0	0
90	2	6	11	14	3	3	3	4	17	10	5	2	0	2
89	0	0	10	9	3	0	4	1	12	3	1	1	0	0
88	3	2	8	3	4	1	5	0	7	1	4	0	0	0
87	5	1	14	6	2	0	4	0	13	0	2	0	1	0
86	2	1	6	2	0	0	4	1	7	0	1	1	0	0
85	3	1	8	3	2	1	3	1	9	0	1	1	0	0
84	3	0	5	0	2	1	2	0	6	1	1	0	0	0
83	1	0	6	0	3	0	1	0	0	0	1	0	1	0
82	2	0	4	0	4	0	1	0	1	0	0	0	1	0
81	0	0	0	0	0	0	0	0	1	0	0	0	0	0
80	1	0	2	0	0	0	1	0	1	0	0	0	0	0
79	0	0	2	0	1	0	0	0	0	0	0	0	0	0
78	0	0	2	0	0	0	0	0	1	0	1	0	0	0
77	0	0	1	0	0	0	0	0	0	0	0	0	0	0
76	0	0	1	0	0	0	0	0	0	0	0	0	0	0
75	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Totals	36	36	108	108	28	28	38	38	117	117	21	21	5	5

the 353 pupils on whom second measurements have been made. Those showing obvious underweight or obvious overweight have not been included in the table, but in general terms it may be said that the degree of improvement in the underweights and overweights was entirely comparable to that of those who are reported.

Study of Table I shows that at first examination there was but one having a postural angle better than 97°, while 325 fell in the bracket 82° to 95° and 238 in the bracket 84° to 91°. One hundred forty-three were in the bracket 87° to 90°. Eleven were above 95° and 17 below 82°.

On second examination after a six-week interval, we find 47 above 95° as contrasted to 11 found in this group on the first examination, and 289 in the 90°–95°; 42 between 84° and 90° and none below 84° as contrasted to 43 below 84° at the first examination.

This leads us to suggest a scale as follows:

95—100 very good
90— 94 good
85— 89 fair
80— 84 bad
75— 79 very bad

On this basis it will be noted from Table II that not only the entire group but each age group raised its average from "fair" to "good."

TABLE II

POSTURE ANGLE RECORDS SHOWING AVERAGES BY AGE GROUPS

Age	No.	Posture Angle		Gain
		1st Exam.	2nd Exam.	
13 yrs.	36	87.86°	93.33°	5.47°
14 yrs.	108	87.43°	82.0°	4.57
15 yrs.	28	86.57°	91.75°	5.18
16 yrs.	38	89.32°	93.11°	3.79
17 yrs.	117	89.53°	93.4°	4.1
18 yrs.	21	88.4°	92.3°	3.9
19 yrs.	5	88.0°	94.2°	6.2

Table III indicates that of 11 in the "very bad" group on first examination, all moved into a higher group on second examination and that of 51 in the "bad" group all but 2 moved into a higher group on second examination. Also the second examination showed 106 in the "very good" group as compared to but 24 on the first examination, while in the "good" group there were 205 on second examination as compared to 119 found on the first examination. Out of a 353 total, 311 were in either the "good" or the "very good" group on second examination as

compared to less than half that number. 143, on the first examination. Only 42 were remaining in that group at the time of the second examination.

PRACTICAL VALUE

The correction of posture in adolescents is much less a matter of such exercises as can be taught and carried out in class periods and in large groups than it is arousing in the pupils a "posture consciousness."

TABLE III

ANALYSIS BY AGE GROUPS AND BY CLASSIFICATION BY p°

Age	No.	95–100		90–94		85–89		80–84		75–79	
		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
13	36	2	17	13	14	13	5	7	0	1	0
14	108	3	32	35	53	46	23	17	0	7	0
15	28	0	4	7	21	11	2	9	1	1	0
16	38	4	11	9	24	20	3	5	0	0	0
17	117	12	37	47	75	48	4	9	1	1	0
18	21	2	2	7	16	9	3	2	0	1	0
19	5	1	3	1	2	1	0	2	0	0	0
Totals	353	24	106	119	205	148	40	51	2	11	0
Percentages		6.8	30.	33.7	58.1	41.9	11.3	14.4	0.57	3.1	0

Whether or not this posture consciousness goes so far as to lead them to carry out definite corrective exercises outside of class hours, it does lead them to keep their posture in mind sufficiently to make conscious efforts at correction. The arousing of this posture consciousness has been very definitely marked in the groups on which this report is based. The fact that they were given a definite and easily understandable record has led not only to much greater interest, but to definite rivalry between them as to which will show the greatest improvement. This new spirit has been so definite and so marked that the room teachers have changed their attitude from a general spirit of tolerance to one ranging from serious interest to real enthusiasm. This interest on the part of both room teachers and pupils is credited with much more of the good results secured than the physical education teacher could have hoped to attain in the short and long separated periods permitted for her class work.

SUMMARY

There is presented a method by which the cervico-thoracic posture can be measured and recorded in simple and easily understandable form.

The comparison of first and second examinations presents evidence of definite and marked improvement in posture on the part of the entire group.

The technic of measuring has not yet been refined and stabilized

to a point which permits the setting up of definite standards, but it is sufficiently reliable to measure the progress of the individual.

The mere fact of being able to record posture in definite and simple terms and so closely approximating those used in grading scholastic accomplishment inspires a posture consciousness which is more productive of correction than any exercise which the teacher can prescribe or teach in the short space of time which can be allotted to this subject in the school curriculum.

The method is applicable to large groups as well as small, to either sex, and to any age in which correction of cervico-thoracic posture is still possible.

It has been found entirely practicable to measure and record the postural angle of from 50 to 60 persons per hour.

Problems of Questionnaire Investigation

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THE questionnaire as a research device has been extensively used in all branches of education. An analysis of 581 investigations, published 10 or more years ago, showed that 143, or almost one-fourth, of them used the questionnaire technique as the chief method of obtaining data.[1] The widespread use of this technique has resulted in its frequent abuse by inexperienced workers, causing a severe condemnation which has too often been justified. Educational authorities agree, however, that the questionnaire method is not in itself inherently unsound, but has suffered its ill repute from misuse by individuals lacking in the tools necessary to the construction and dissemination of worth-while educational material.

The purpose of this paper is twofold. First, to present a discussion of the chief advantages and disadvantages of the questionnaire method; second, to present criteria which might be useful (a) in the construction of a questionnaire, (b) in judging the merit of a questionnaire already constructed.

In order to understand many of the problems concerned in the questionnaire it is well to examine some of its advantages and disadvantages, as experienced by those familiar with the technique. The severest criticism of the questionnaire results from the possibilities of error which may occur in its use.

1. The questionnaires returned may not constitute a random sampling of those sent out. Unreturned questionnaires and answers left blank on those returned may result in selection which will tend to decrease the validity of the data. It has been stated,[2] however, that the danger of the selected response has been overestimated, and if a reply of more than 50 per cent is received, that this factor is probably not decisive in affecting the results of the typical questionnaire. At the same time, it is important to bear in mind that a reply of practically 100 per cent should be obtained, whenever possible, so this danger will be entirely obviated. The conscientious worker will be able to do much to eliminate this source of error. First, by a very careful preparation of the questionnaire and second, by follow-up letters to elicit responses

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1 L. V. Koos, "Specific Techniques of Investigation: Observation, Questionnaire, and Rating," *National Society for the Study of Education, 37th Yearbook*, Part 2, pp. 375–90.

2 "The Questionnaire," *Research Bulletin of the National Education Association*, 8: 1 (June 1930) 9.

from those failing to respond the first time. Toops [3] was able to get 100 per cent replies to 110 questionnaires by the use of 6 follow-up letters.

2. The form of the question or instructions to recipients may suggest the answers desired by the investigator. This may lead the respondents to modify their answers in an attempt to give the investigator what he wants, resulting in unreliable data. This error may be entirely eliminated by careful preparation of the questions.

3. The type of response called for may result in answers which do not lend themselves easily to interpretation. In an analysis of 500 questionnaires, representing a period of 38 years, Davis and Barrow [4] found that the most frequently used type of response was the "variable verbal response," which usually calls for an expression of opinion or judgment in some form. Davis and Barrow consider this to be an indication of careless construction, as it results in difficulty of classification and treatment of information which may minimize the value of the findings. They recommend that questions call for an objective type response and their opinion is substantiated by most authorities in research. There is, however, another angle to this problem, as suggested by Ruckmick,[5] who criticises the questionnaire procedure because it favors explicit or categorical answers. Ruckmick maintains that the expert hesitates to give an unqualified answer to a question and would therefore tend to shun a questionnaire requiring explicit answers.

4. Inaccurate replies resulting in unreliable data may be caused by many factors. Probably one of the most important of these is lack of interest, with resultant careless reporting. Davis and Barrow [6] found that in obtaining replies the most frequently used type of approach was "intercession." Others following in the order of their frequency were, teacher-pupil, personal approach, appeal to interest, waiver of signature, committee or organization, letter preceding, and promise of summary. In the "intercession" method the investigator appeals first to someone in authority, either directly or indirectly, over those from whom he hopes to get a response. It is undue pressure from those in authority that tends to produce inaccurate responses, especially from those individuals who lack interest in the study. Inaccurate replies also result from carelessness and haste in reporting, lack of knowledge, and difficulty in securing information requested. Probably a more careful selection of those to whom the questionnaire is sent would do much to eliminate this source of error.

5. The statistical treatment of data may lead to false assumptions.

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[3] H. A. Toops, "Returns to Follow-up Letters to Questionnaires," *Journal of Applied Psychology*, 10 (1926) 92–101.

[4] R. A. Davis and E. L. Barrow, "Critical Study of the Questionnaire in Education," *Educational Administration and Supervision*, 21 (February 1935) 137–44.

[5] C. A. Ruckmick, "The Uses and Abuses of the Questionnaire Procedure," *Journal of Applied Psychology*, 14 (1930) 32–41.

[6] Davis and Barrow, *loc. cit.*

In tabulating results, investigators tend to group data with disregard for qualifying statements, overlapping, and other minor inconsistencies. Too often, glibly quoted figures are given which are actually doing nothing but glorifying an unsound piece of work. However, this criticism of the questionnaire method is answerable in improved standards of construction and increased discrimination on the part of the recipients in determining which questionnaires are worthy of an answer.

6. In spite of the universal use of the questionnaire, little has been done to determine scientifically the validity and reliability of this method. In Davis and Barrow's[7] study, 119 made statements concerning validity, but only 3 of the 500 investigators gave a coefficient of validity. The most commonly used method for determining validity was comparing the answers in the questionnaire with an outside criterion. Twenty of these same investigators made a statement concerning reliability, but only 4 of the 500 gave coefficients, which were computed by correlating one half of the questionnaire with the other half.

Although this lack of proved validity and reliability may constitute a serious criticism of the questionnaire technique, it is not sufficient to discredit the method, but should indicate to the thoughtful educational worker a field for serious effort.

7. Several other criticisms which have been leveled against the questionnaire are so obviously the fault of the inexperienced or careless worker that they will be accorded only brief mention. These include the accusation that the questionnaires are frequently poorly prepared, are on topics of slight educational significance, the information asked for is available from other sources, inadequate summarizations are given with the omission of facts necessary to the evaluation of the findings, and that the method is overly time-consuming. It is true that a worth-while questionnaire is often a lengthy one, but certainly the time spent by each individual in answering it is justified by the results of the study. It is the time spent in answering lengthy questionnaires of no educational significance which has brought forth this last criticism.

Although the questionnaire has been subject to the many criticisms mentioned in the preceding paragraphs, the evidence also indicates that studies of this nature have contributed much of educational value.

1. The method is thought indispensable by many school executives for purposes of gathering material concerning educational practices and procedures.

2. One of its major advantages lies in the time factor. It would be impossible to collect such a large number of returns by any other means, and its discontinuance would impose severe limitations on the research worker seeking extensive data.

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[7] *Ibid.*, pp. 143–4.

3. The properly prepared questionnaire must necessarily be preceded by a very careful survey of the field concerned, with a thorough investigation of all aspects of the problem. This preliminary survey of the total problem not only produces a more careful study, but often furnishes clues to other problems, deserving of intensive study by research workers.

Because this method of inquiry has contributed substantially to educational advance, the thoughtful researcher does not advocate its abolition, but would rather attempt to strengthen its position by eliminating the many unnecessary abuses to which it has been subjected.

PRELIMINARY RESEARCH AND PREPARATIONS

1. Be sure that the topic is a worthy one serving some meaningful purpose and evoking valuable information and material. It should appear to be of value not only to the investigator, but to those from whom answers are desired. The advice of one or more experienced investigators should be obtained.

2. Use the questionnaire technique only when there is no other feasible means of obtaining the data. A great deal of information may be derived from catalog material, school records and reports, government reports, and publications of educational foundations and associations.

3. Make a comprehensive study of the field to insure familiarity with all available literature. The problem can then be defined specifically and the field delimited. A large study has many ramifications and the investigator must determine in advance how extensive his inquiry is to be. Familiarity with all the literature will also eliminate duplication.

4. In selecting the individuals and institutions to whom the questionnaire will be sent, ascertain that comparable conditions exist. Consider the ability and willingness of the persons approached to answer so that those chosen are the ones in the best positions to give reliable answers. Remember the cooperative nature of the questionnaire and don't make unreasonable demands of people who already have many duties of their own. In most studies it probably would be of much greater value to get the opinion of a few carefully selected individuals than by simply broadcasting the questionnaire indiscriminately.

5. Secure adequate sponsorship, such as the office of a superintendent of schools, schools or departments of education, or professors of these departments, or state and national education associations. Poorly prepared questionnaires may be eliminated by reference to one of these agencies, and where sponsorship is not secured it can be used as a basis for not answering the questionnaire.

6. The cost of the complete study should be considered. Be sure that adequate funds are available for the preparation of the original

questionnaire, follow-up letters, and for disseminating the results. Follow-up is especially important to avoid errors due to selection.

7. Consider the time necessary for tabulation in determining the length of the questionnaire and the number of people to whom it will be sent.

8. Make the first questionnaire adequate and complete, obviating any necessity for a second, supplementary one.

9. If the questionnaire is to be sent to a large number of individuals and is concerned with a nationally vital problem, it should be tried out on a sampling of the group and corrections made on the basis of the preliminary tryouts.

DESIRABLE PRACTICES IN QUESTIONNAIRE CONSTRUCTION

1. The questionnaire should deal primarily with matters of fact, avoiding questions demanding subjective judgment or opinion. The response to questionnaires demanding opinion is relatively poor and probably more reliable information can be elicited from the mature judgment of one or two experts than from the opinion of a large number of respondents of varying ability. Answers to questionnaires of opinion are so time-consuming that many respondents will offer hastily expressed opinions of little merit.

2. If opinions are required for a particular study, the group of respondents should be limited to experts and the questionnaire constructor should be an experienced research worker.

3. It is important that brief but definite instructions on how to answer be given. Questions must be clearly and carefully worded so as to avoid the two types of ambiguity that often appear in questionnaire studies. (1) Owing to ambiguity of statement, questions may be interpreted differently by different people, resulting in equivocal and incomparable replies. Questions should be so worded that any possibility of misinterpretation of meaning is eliminated. Unfamiliar and technical terms must be clearly defined; (2) ambiguous replies are often evoked by poorly worded questions which ask for the wrong type of answer. As a general rule, it is well to make questions answerable by one of the objective types of replies that cannot possibly be misunderstood. Several of the objective type answers are: (1) yes and no; (2) quantitative, as a percentage; (3) checking, underlining, and encircling answers; (4) rating answers, as on a basis of good, fair, or poor; (5) ranking answers in order of numerical importance. By use of this type answer it is also possible to relieve the respondent of a great deal of writing, although care must be taken to construct the questions so they will be suitable for this kind of answer.

4. The questionnaire should be as short as possible and still meet the objectives of the study. By the elimination of unnecessary questions

and having those used concise and following a logical sequence, much will be accomplished toward assuring a larger number of returns.

5. As in most questionnaires the purpose should be to get objective quantitative information, the questions should be worded in such a way that they lend themselves to tabulation and statistical treatment.

6. Eliminate data that will necessitate a lot of extra work on the part of the respondents. Questions should be answerable by him or his immediate staff without requiring any research or making outside contacts.

7. Avoid questions of a personal nature unless they are absolutely essential to the study. When they are necessary, care should be taken to assure the respondent that his answers will be untraceable in the report, otherwise the number of replies will be greatly reduced.

8. When data involving personal accomplishments are requested, the replies may be invalid, as most people seem to be unable to resist the temptation to create a favorable impression through overstatement.

9. State questions in such a way that no preconceived notions can be formed concerning the answers desired. The results will be unreliable where any bias is suggested in the questions.

10. It is sometimes necessary to frame more than one question in order to establish a point of considerable importance. Questions should be interrelated in such a manner that all angles of the point will be adequately covered and the final conclusion will not be based on a single isolated statement.

11. It is desirable to send a separate letter of transmittal with the questionnaire. This should include a statement of the purpose of the investigation, mention the organization or individual sponsoring the study, tell how the results will be disseminated, guarantee each respondent a copy of the results, and generally acquaint the recipient with all pertinent information.

12. Two copies of the questionnaire blank should be sent to each respondent, one to be returned and one to be kept for his own files. When this procedure is followed it is possible for the respondent to have his own report on record for any future reference needs.

13. The inclusion of a self-addressed, stamped envelope is a practice which should predispose respondents favorably, although it does not place any obligation upon them.

14. Everything should be done to make the questionnaire as easy as possible to answer.

a) The size of the questionnaire should be convenient for handling.

b) The arrangement of questions and spaces for answers should be as attractive to the eye as possible.

c) The questionnaire should be neatly reproduced. In a small study, typing is acceptable, but printing is by far the most desirable method.

d) The form should include ample space for identifying information, as name, address, and official position of respondent.

e) Provide adequate space for answers. A line, parentheses, or hollow square will make it possible to have uniform arrangement of answers and will facilitate tabulation.

f) Tabulation will be aided by placing answers near the right hand margin.

g) Where opportunity for "other answers" is given, allow sufficient space.

h) Keep main categories clearly separated.

15. In selecting individuals to whom you will send the questionnaire, remember that mere quantity does not insure quality. At the same time it is important that a sufficient quantity be sent out to satisfy the need for reliability in spite of losses due to different reasons.

SUMMARY AND CONCLUSIONS

The questionnaire is an important and widely used research technique. Although it has been subjected to severe criticism often of a justifiable nature, the evidence still indicates that no general abolition is necessary, but rather a need for cooperative action on the part of everyone concerned.

The primary action lies with the individual formulating the questionnaire. He must first of all make a comprehensive study of the entire field, covering all available literature. When he has all aspects of the problem well in mind, he is then ready to construct the questionnaire, which should be formulated and disseminated in light of the desirable practices recommended by experienced investigators.

The secondary action lies with the recipient of the questionnaire, who should refuse to respond to inquiries which do not seem to be answering a problem with any educational significance, that are not adequately sponsored, and which do not follow the principles recommended for questionnaire construction.

The implication is that both the individual who is preparing the questionnaire and the one who is receiving it must be well acquainted with the practices which will return the questionnaire to the position of favor proportionate to its usefulness.

AN INFORMAL RATING PLAN FOR QUESTIONNAIRES[8]

1. Is the questionnaire adequately sponsored?
2. Is the purpose of the study frankly stated, and is it one which calls for a reply under the policy set up for dealing with questionnaires?
3. Is the questionnaire on a worthy educational topic?
4. Is the questionnaire well organized?

[8] "The Questionnaire," *The Research Bulletin of the National Education Association*, 8: 1 (January 1930) 39.

5. Are the questions clearly and briefly worded?

6. Can most of the questions be briefly answered with a check mark or by a fact or figure, and is the number of questions requiring extensive subjective replies kept to a minimum?

7. Is the information requested not available elsewhere and obtainable only through questionnaire?

8. Is the questionnaire set up in proper mechanical form?

9. Are the demands of the questionnaire reasonable?

10. Is a summary of results or other proper return promised respondents?

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Evaluating Team and Individual Performance in Basketball

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THIS study involves the home games for the University of Kansas basketball team during the 1938-39-40 seasons. It is an attempt to better evaluate individual and team performance. There is quite general agreement that the box score does not give a very complete statistical picture of the game and is consequently of little value to coach or player from the standpoint of game analysis. Much takes place during the course of a basketball game, which, in the final analysis, contributes materially to the success or failure of a team. Many of these factors are not apparent to the average observer or are they evidenced in the generally accepted summary of the game. It can be argued that the success of a team is well shown in the box score, but there are many important data which are not kept which might be of value to the coach and player.

The personal foul is usually considered as the only costly mistake, while the measure of success is usually considered in the number of points scored. In reality many offensive mistakes are made during the course of a game which may result in the loss of the ball, as in committing a violation or a wild pass. These mistakes, which may actually spell the difference between victory and defeat, are, of course, not listed in accounts of the game. Likewise, the player who is well versed in the fundamentals of basketball may handle the ball flawlessly and may, by his passing, be one of the important factors in a team's scoring power; but if he does not score, his name appears in the box score only as having participated. It is not contended that the method explained herein should be accepted to replace the common game summary. Neither is it claimed that this study adequately solves the problem at hand, but these data have proven both interesting and useful to the coach and players.

PROCEDURE

The first step in this study was the development of a list of offensive basketball items. These game elements were divided into two groups. The first of these groups was composed of those factors which are considered contributory to winning success (positive items). The second

group was made up of elements which are considered detrimental to winning success (negative items). After due consideration each item was subjectively weighted. Those in the first group were given positive weightings with an evaluation commensurate with the importance to sound fundamentals and winning success. The simple pass and catch were each given a single point evaluation while the top ranking in evaluation points was given to the field goal with a rating of ten points. Each item in the second group was given a negative evaluation rating. The error of omission was valued at a single negative point while the maximum negative rating was the personal foul which was given a weight of eight points. In the use of these weighted items, the algebraic sum of the positive and negative evaluation points was computed. The sum of the evaluation points represented offensive efficiency of the team or player (Exhibit A).

EXHIBIT A

THE ITEMS AND THEIR RESPECTIVE WEIGHTS USED IN THE 1938 EVALUATION STUDY

	Weight in Evaluation Points
A. Positive Items	
1. Field goals	10
2. Free throws	5
3. Immediate assists	4
4. Secondary assists	3
5. Recovers ball off opponent's backboard	2
6. Recovers ball off own backboard	2
7. Taps and recovers own jump ball	2
8. Recovers team mate's jump ball	1
9. Makes a good pass to a team mate	1
10. Catches a team mate's pass	1
B. Negative Items	
1. Error of omission	1
2. Held ball obtained by an opponent	1
3. Fumbles ball and it goes out of bounds	2
4. Fumbles ball and it is obtained by opponent	2
5. Taps ball out of bounds	2
6. Wild pass out of bounds	3
7. Wild pass to an opponent	4
8. Violation of rules	5
9. Personal offensive foul	8

Using the above mentioned weighted items, data were gathered and the figures were computed for the nine games at home for the University of Kansas team during the 1938 season. Similar data were also collected on the opponents in the three final home games of that season. Twelve men physical education students were used during each game to secure the desired information. The men worked in pairs; one as an observer, the other as a recorder. The duties were so distributed that no single pair was overburdened. These helpers were familiar with all aspects of the game and were adequately trained in their specific duties. Goals and attempts were secured from spot-shot charts. Free throws and attempts and personal fouls were secured from the official

EXHIBIT B

SAMPLE OF WORK SHEET

Evaluation Points	
10	Field Goals
5	Free Throws
4	Immediate Assists
3	Secondary Assists
2	Recovery of ball off own backboard
1	Recovers team mate's Jump Ball
1	Recovery of opponent's fumble
1	Good passes
1	Good catches
	Total positive evaluation points, Offensive
1	Error of omission
1	Held ball forced by opponent
2	Fumbles out of bounds
2	Fumbles to opponent
2	Taps ball out of bounds
3	Wild pass out of bounds
4	Wild pass to opponent
5	Violation
8	Offensive personal foul
	Total negative evaluation points, Offensive
	Net offensive evaluation points
4	Blocking opponent's shot
3	Intercepting opponent's dribble
2	Intercepting opponent's pass
4	Recovery from opponent's backboard
2	Batting ball from opponent's hands and recovering
1	Batting ball from opponent's hands and not recovering
2	Forcing held ball
1	Cuts off opponent's pass, but not re-covering
	Total positive evaluation points— Defensive
8	Fouling opponent with ball
8	Fouling opponent without ball
	Total negative evaluation points, Defensive
	Net defensive evaluation points
	Total positive defensive and offensive evaluation points
	Total negative defensive and offensive evaluation points
	Net defensive and offensive evaluation points

score book. Passes, catches, immediate and secondary assists were listed in order of occurrence, i.e., as the observer called out the number of the man handling the ball, his number was recorded by his coworker. As long as passing continued uninterrupted, the numbers were recorded. With the loss of the ball, a break was indicated by a mark across the line. Attempted shots were recorded on these sheets by circling the number of the player involved. If a goal resulted from the attempt, an "X" was placed in the circle over the number of the player. These sheets served as a check on the spot shot charts. In the process of tabulation, immediate and secondary assists were readily secured by crediting the player who passed to the scoring team mate with an immediate assist while the one who passed to the player securing an immediate assist was given a secondary assist. The other items listed (Exhibit A) were mimeographed upon appropriate sheets upon which the number of the player in question was recorded as each item occurred.

Having secured the desired data, they were tabulated upon mimeographed work sheets containing adequate spaces for earned evaluation points for each item (Exhibit B). Game summaries including a gross computation of evaluation points for Kansas and opponents were prepared immediately following each game. These were posted in the team dressing room before the next practice period.

Although the data for the 1938 season will be discussed later, it is perhaps well to mention here that individual player standings were compared with the subjective rankings as to offensive ability, by squad members themselves, the freshman numeral-men, and the coach.

For the 1939 and 1940 seasons the evaluation technique was extended to include a defensive rating system for both the team and the individual player. All items and their evaluation weights, as used for both the Kansas team and opponents for the sixteen home games during these two seasons, are listed in Exhibit C.

Throughout the study, one of the most difficult problems confronting the observers was the fact that frequently the identity of player jersey numbers was practically impossible. Numbers which are the same color, although outlined in a contrasting color, blend into the jersey color at a distance. Orange numbers on an orange jersey, red numbers on a red jersey, purple on purple, etc., have no doubt contributed to errors by observers.

DEFINITIONS OF TERMS

1. *Immediate Assist.*—A pass made to a player who scores a field goal.
2. *Secondary Assist.*—A pass directly preceeding an immediate assist.
3. *Error of Omission.*—A mistake in judgment or observation, such as failure to pass to a team mate in a better position for scoring.
4. *Ball Handling Errors.*—(*a*) Held ball forced by an opponent (when a player having complete control of the ball, by poor judgment or poor

EXHIBIT C

ITEMS AND THEIR RESPECTIVE WEIGHTS USED IN 1939–1940 EVALUATION STUDY

OFFENSIVE	*Weight in Evaluation Points*
A. Positive items	
1. Field goals	10
2. Free throws	5
3. Immediate assists	4
4. Secondary assists	3
5. Recovers ball off own backboard	2
6. Recovers team mate's jump ball	1
7. Recovers opponent's fumble	1
8. Good pass to a team mate	1
9. Catches team mate's pass	1
B. Negative items	
1. Error of omission	1
2. Held ball forced by opponent	1
3. Fumbles ball and it goes out of bounds	2
4. Fumbles ball and it is obtained by opponent	2
5. Taps ball out of bounds	2
6. Wild pass out of bounds	3
7. Wild pass to an opponent	4
8. Violation of rules	5
9. Offensive personal foul	8
DEFENSIVE	
A. Positive items	
1. Blocking opponent's shot	4
2. Recovery from opponent's backboard	4
3. Intercepting opponent's dribble	3
4. Intercepting opponent's pass	2
5. Forcing held ball with opponent	2
6. Batting ball from opponent's hands and recovering	2
7. Batting ball from opponent's hands and not recovering	1
8. Cuts off opponent's pass, but not recovering	1
B. Negative items	
1. Fouling opponent with ball	8
2. Fouling opponent without ball	8

technique on his part is "tied up" by an opponent to such an extent that an official calls a held ball), (*b*) fumbles and ball out of bounds, (*c*) fumbles and ball is obtained by opponent, (*d*) wild pass out of bounds, (*e*) wild pass to opponent.

5. *Ball Handling Error Rate.*—Ball handling errors divided by good passes, plus good catches, plus ball handling errors.

6. *Scoring Ability Index.*—Number of goals made times per cent of goals made plus one-half multiplied by (number of free throws made times per cent of free throws made).

7. *Net Evaluation Points.*—The total positive offensive and defensive evaluation points less the total negative offensive and defensive evaluation points.

8. *Offensive Playing Efficiency.*—Total positive offensive evaluation points divided by the sum of the positive and negative evaluation points.

9. *Defensive Playing Efficiency.*—Total positive defensive evaluation points divided by the sum of positive and negative defensive evaluation points.

10. *Composite Playing Efficiency.*—Team positive offensive and defensive evaluation points divided by the sum of the team positive offensive and defensive evaluation points and the team negative offensive and defensive evaluation points.

THE DATA

Certain pertinent data relative to team performances are shown in Tables IA, IB, IC, II, and III. An attempt to compare seasonal data is not entirely satisfactory because of the fact that, although the data were kept for 9 home games in the 1938 season for the Kansas team, they were collected for but 3 of the opposing teams during that season. The Kansas team won 24 of the 25 games involved in this study. It is unfortunate that data were not gathered for the opposing team during the contest lost by the Kansas team.

During the 1938 season a player receiving a pass and in return passing to a team mate who scored a goal was given credit for a catch, a pass, and an immediate assist. During the 1939 season this technique was changed so that the player in this situation was given points only for an immediate assist. Starting with the 1939 season evaluation points for the recovery of rebounds from the opponent's backboard were computed with the defensive items rather than with the offensive as was the case during the previous season.

For the 1938 season, the highest total evaluation points accumulated in a single game was 1167 in the one with team I (Table IA). It would not seem that the mere fact that Kansas scored 20 more points than the opposing team, or because of the comparatively high percentage of goals made, explains adequately the high evaluation point total. While the 33.8 per cent of goals made in this game is third highest for the season, it is interesting to note that Kansas made comparatively few mistakes and committed comparatively few personal fouls in the game. There were but 4 violations and but 10 errors in ball handling or 1.5 per cent of errors in ball handling, the season's lowest figure in this department. Another interesting fact regarding this game was that the Kansas team accumulated its largest total rebounds of the season for a single game (66). All these facts account not only for the high total of evaluation points, but for the season's highest offensive efficiency.

The greatest percentage of goals made by the Kansas team during the 1938 season was achieved in the game with team D. In this contest the Kansas team made 35.1 per cent of its shots. The exceptional percentage of goals accounting largely for the high score of the season for a single game was sufficient only to accumulate 1095 evaluation points (the third highest for the season, Table IA). The total was naturally affected by the 15 personal fouls. This was the highest single game total of fouls for the season. Likewise the third highest percentage of ball handling errors (2.6 per cent) was made in this game. There were 6 violations in this contest. This latter figure was equalled only once during the season.

TABLE IA
Composite Totals for Kansas vs. Opponents—1938 Season

1938	Score	Goals Made	Per Cent Goals Made	Free Throws Made	Per Cent Free Throws Made	Personal Fouls	Total Passes and Catches	No. Errors Ball Handling	Per Cent Errors Ball Handling	Recovery of Rebounds	Violations	Offensive Efficiency	Defensive Efficiency	Comp. Playing Efficiency	Net Evaluation Points
Kansas	41	15	21.1	11	78.6	13	783	17	2.1	49	2	93.8			1119
Team A	27														
Kansas	39	16	25	7	46.7	9	747	16	2.1	26	1	95.4			1042
Team B	29														
Kansas	26	11	16.7	4	57.1	5	776	17	2	40	3	94.4			1004
Team C	21														
Kansas	62	26	35.1	11	55	15	641	17	2.6	49	6	93.3			1095
Team D	33														
Kansas	46	16	31.4	14	51.9	11	690	13	1.9	35	5	93.2			1008
Team E	49														
Kansas	31	10	15.8	11	57.9	12	679	16	2.3	45	1	93.7			915
Team F	17														
Kansas	48	17	33.3	14	77.8	13	623	18	2.8	39	6	91.1			937
Team G	33	12	16.5	9	56.3	15	441	18	3.9	41	4	91.4			667
Kansas	35	16	34.8	3	37.5	5	738	28	3.8	43	5	91.6			984
Team H.	33	15	29.4	3	60	8	326	26	7.4	24	5	86.6			534
Kansas	56	23	33.8	10	62.5	9	680	10	1.5	66	4	96.9			1167
Team I	36	12	20	12	52.1	13	325	13	3.8	20	7	89.1			550
Totals															
Kansas (*)	384	150	27.1	84	59.1	92	6357	152	2.4	392	33	93.8			9271
Kansas (†)	139	56	33.9	27	64.3	27	2041	56	2.7	148	15	93.3			3088
Opponents (†)	102	39	21.2	24	54.5	36	1092	57	4.9	85	16	89			1751

* Includes 9 games. † Includes 3 games.

It will be noted that in all games during the three seasons the Kansas team accumulated the greatest number of evaluation points for passes and catches. This is due largely to the type of offense employed by the team. The ball is passed continuously until the right offensive situation arises. The question has been raised as to whether the passes and catches should receive so much consideration in the scoring of evaluation points. It is here contended that if the ball handling is fundamental to success, there should be a certain premium placed upon successful accomplishment in this branch of play. In any event it is reasonable to assume that the more frequently the ball is passed, the greater is the opportunity for error. This situation can be compared to baseball, in which the greater number of fielding chances causes the greater possibility for error.

During the 1938 season in the three games in which data were collected on both Kansas and the opposing teams, all games were won by the Kansas team, and, according to the data, Kansas presented a better record in most branches of play (Tables IA and II). The Kansas team gathered a total of 3088 evaluation points as compared to 1751 for the opponents. The home team secured 139 points as compared to 102 for the opposition with a percentage of 33.9 as against 21.9 for goals made. While Kansas presented a better seasonal offensive efficiency (93.3 to 89) the number of ball handling errors was but one greater for the opponents (56 to 57). The per cent of ball handling errors was 2.7 for the home team and 4.9 for the opposition. Wild passes and fumbles and violations were about equal but the opponents committed 9 more personal fouls than the Kansas team.

As has been mentioned previously, starting with the 1939 season the evaluation technique was extended to include certain defensive items (Exhibit C). In this season the Kansas team accumulated a total of 8429 net points as compared to 5932 for the opponents. The largest number of points for a single game for the Kansas team was 1169. Team E, the opposing team in this game, made the lowest number scored by a visiting team during the season (581), (Table IB). While the home team secured the composite playing efficiency rating of 91.2, the season's second highest, team E rated the lowest for the season with 79.1. The percentage of goals made was 24.7 per cent for Kansas and that for the opposing teams was 24 per cent. The fact that the winning team hit 81.2 per cent of its free throws would lead one to assume that it was this factor alone which won the game. However, Kansas made but 4 more free throws than did team E. Personal fouls were about equal (14 and 13). The fact that team E made 18 errors in ball handling or 4.5 per cent for the season's poorest rating, and Kansas made but 8 errors with a percentage of 1.1, and that Kansas made but one violation while team E committed a total of 9 would seem to explain the defeat more fully. Since ball handling errors usually result

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TABLE IB

COMPOSITE TOTALS FOR KANSAS VS. OPPONENTS—1939 SEASON

1939	Score	Goals Made	Per Cent Goals Made	Free Throws Made	Per Cent Free Throws Made	Personal Fouls	Total Passes and Catches	No. Errors Ball Handling	Per Cent Errors Ball Handling	Recovery of Rebounds	Violations	Offensive Efficiency	Defensive Efficiency	Comp. Playing Efficiency	Net Evaluation Points
Kansas	25	8	14.5	9	52.9	15	732	8	1.1	32	2	95.4	52	86.9	890
Team J.	20	6	13.3	8	47.1	14	670	20	2.1	27	8	90.8	52.3	82.9	754
Kansas	39	16	23.8	7	50	14	793	6	.8	47	5	96.4	55.4	89.2	1121
Team K	33	11	18.9	11	78.6	13	561	6	1.1	28	2	96.8	46.9	87.2	757
Kansas	33	10	16.7	13	72.2	14	583	8	1.4	43	7	93.4	61.7	86.1	846
Team H	29	10	18.5	9	52.9	16	518	16	3	33	1	94.4	45.3	83.3	689
Kansas	37	15	16.9	7	53.8	14	754	14	1.8	36	2	95.9	54.1	88.4	1048
Team I	32	13	20	6	42.9	12	596	10	1.6	39		95	61.7	88.1	835
Kansas	34	15	22.7	4	36.4	9	734	13	1.8	37		97.8	64.2	92.5	1061
Team L	27	10	20.4	7	63.6	11	608	8	1.3	38	5	95.4	59.1	88.2	828
Kansas	49	22	29.3	5	27.8	11	734	16	2.2	57	9	93.5	67.6	88.7	1141
Team G	46	19	28.4	8	53.3	15	421	7	1.6	37	2	94.8	49.5	85	721
Kansas	46	16	21.3	14	63.6	14	788	4	.5	48	4	94.6	65.8	89.9	1153
Team F	37	15	24.6	7	43.8	17	598	14	2.3	19	1	96.1	33.7	84.6	767
Kansas	59	23	24.7	13	81.2	13	711	8	1.1	39	1	97.6	56.6	91.2	1169
Team E	45	18	24	9	69.2	14	400	18	4.5	24	9	88.2	34.1	79.1	581
Totals:															
Kansas	322	125	21.5	72	55.8	104	5829	77	1.3	339	30	95.6	59.8	89.2	8429
Opponents	269	102	21.7	65	55.6	112	4372	90	2.2	263	28	93.9	48.5	84.8	5932

in loss of possession of the ball they play an important part in the outcome of the game.

The data for the game with team G during the 1939 season are interesting. Although Kansas won the game by only 3 points, there was a difference of 420 points (evaluation) in favor of the winning team. There was a difference of 313 points in passes and catches, owing largely perhaps to the difference in types of offense employed by the two teams. Kansas, with a slightly better percentage of goals made, had a poorer offensive efficiency (93.5 as compared to 94.8), but a decidedly better defensive efficiency (67.6 as compared with 49.5) and a composite playing efficiency of 88.7, while that for the opposition was but 85 per cent. Team G made 4 more personal fouls than did Kansas, but the home team made but 5 points by free throws for the poorest percentage by any team in the three-season study (27.8). Kansas committed 9 violations as compared to 2 for team G, and also made its poorest showing in ball handling for the season with an error rate of 2.2 per cent. The slightly better percentage of goals made and better defensive play apparently were in this case sufficient to win.

Comparing the Kansas totals with those for the opponents for the 1939 season (Tables II and III) we find that while the per cent of goals and per cent of free throws for the home team and opponents are in both instances practically identical, Kansas was able to score 322 as against 269 for the visitors. This would indicate that the real difference was in the fact that, with one exception, the Kansas record is better otherwise. This was in the fact that the home team committed a total of 30 violations while the visitors were making only 28. The opponents committed 112 fouls while Kansas was guilty of but 104. In ball handling, Kansas made 77 errors as compared to 79 for the opponents. Kansas showed a slightly better offensive efficiency, a decided advantage in defensive efficiency, with a better composite rating (Tables IB and II).

Table III shows that during the 1939 season Kansas averaged 148.1 negative evaluation points while the opponents netted 161.6. This indicates that the Kansas team made fewer mistakes than the opposing teams. The same table shows that, on the average, Kansas made 13.4 immediate assists, and 11.3 secondary assists per game while the opposition made an average of 9.8 and 7.3 respectively, per game. This would indicate that the proper handling of the ball in scoring situations is closely associated with winning success.

It is perhaps well to mention that there is no attempt herein to exhibit the prowess of the Kansas team. As previously mentioned, from the standpoint of the data it is unfortunate that the Kansas team won all games in which data were collected on both teams. It is realized that there is a decided advantage to the team playing on its own court.

The data for the 1940 season show that Kansas earned a total of

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TABLE IC

Composite Totals for Kansas vs. Opponents—1940 Season

1940	Score	Goals Made	Per Cent Goals Made	Free Throws Made	Per Cent Free Throws Made	Personal Fouls	Total Passes and Catches	No. Errors Ball Handling	Per Cent Errors Ball Handling	Recovery of Rebounds	Violations	Offensive Efficiency	Defensive Efficiency	Comp. Playing Efficiency	Net Evaluation Points
Kansas	34	11	30.5	12	52.2	15	773	9	1.2	21	2	96.8	45.9	88	973
Team L	30	11	23.9	8	50	20	649	8	1.2	15	5	95.8	31.9	82.6	738
Kansas	40	16	30	8	53	9	624	8	1.3	37	4	94.7	70.2	90.2	958
Team G	24	8	14	8	66.7	13	682	6	.9	24	7	92.7	40.1	85.7	780
Kansas	36	14	20	8	50	12	813	7	.9	50	4	96.8	63.9	90.6	1139
Team F	34	14	22	6	50	14	653	8	1.2	36	2	97.1	54.9	88.3	911
Kansas	42	16	23.5	10	58.8	7	741	10	1.4	54	6	95.4	78.8	92.3	1187
Team I	40	18	25.7	4	50	18	613	18	2.9	39	2	92.9	49.8	84.8	868
Kansas	46	14	36.8	18	78.3	14	856	4	4.7	29		99.2	53.5	91.4	1188
Team E	26	8	12.1	10	58.8	22	437	8	1.8	18	1	96.7	29.6	77.8	493
Kansas	34	12	21.4	10	71.4	9	853	9	1.1	26	3	96.4	56.3	91	1121
Team H	33	12	23.5	9	81.8	13	599	4	.7	16	3	93.8	48.2	88	785
Kansas	63	25	40	13	70	9	478	4	.8	25		98.5	63.8	92.6	994
Team M	31	13	18	5	50	16	495	4	.8	24	..1	97.8	58.2	84.9	669
Kansas	37	17	25	3	50	8	449	6	1.3	32	2	96.9	60.9	90.7	774
Team M	26	10	20	6	60	6	618	6	1	3	7	93.7	18.7	88.9	724
Totals:															
Kansas	332	125	27.7	82	61.6	83	5787	56	1	274	21	96.9	64.4	91.1	8334
Opponents	244	94	20	56	58.3	122	4746	62	1.3	175	28	94.9	41.2	85.6	5968
Kansas (25 games)	1038	400	25.2	238	58.6	279	17973	285	1.6	1005	84	95.3			26034
Kansas (19 games)	793	306	25.2	181	59.6	214	13657	189	1.4	741	66	95.8	62	90	19851
Opponents (19 games)	615	235	21.3	145	56.4	270	10210	218	2.1	505	72	93.7	45	85	13651

Kansas (19 games)	793	300	25.2	181	59.6	214	13057	189	1.4	741	66	95.8	62	90	19851
Opponents (19 games)	615	235	21.3	145	56.4	270	10210	218	2.1	505	72	93.7	45	85	13651

TABLE II

SEASONAL TOTALS FOR KANSAS VS. OPPONENTS
1938, 1939, AND 1940 SEASONS

	1938*		1939		1940		Total	
	Kan.	Opp.	Kan.	Opp.	Kan.	Opp.	Kan.	Opp.
Score (Total)	139	102	322	269	332	244	793	615
Goals attempted	165	184	582	469	449	471	1196	1124
Goals made	56	39	125	102	125	94	306	235
Per cent of goals made	33.9	21.2	21.5	21.7	27.7	20.0	25.2	21.3
Free throws attempted	42	44	129	117	133	96	304	257
Free throws made	27	24	72	65	82	56	181	145
Per cent of free throws made	64.3	54.5	55.8	55.5	61.6	58.3	59.6	56.4
Personal fouls (total)	27	36	104	112	83	122	214	270
Offensive fouls	3	3	7	4	2	9	12	16
Defensive fouls	24	33	96	110	81	113	201	256
Violations	15	16	30	28	21	28	66	72
Recovery, own backboard	70	45	110	87	88	49	268	181
Recovery, opp. backboard	78	40	209	176	186	126	473	342
Good passes	1043	607	3034	2234	3034	2403	7111	5244
Good catches	998	485	2795	2138	2753	2343	6546	4966
Total ball handling errors	56	57	77	99	56	62	189	218
Per cent ball handling errors	2.7	4.9	1.3	2.2	1.0	1.3	1.4	2.1
Wild passes	19	20	25	37	22	17	66	74
Fumbles	20	20	23	22	11	9	54	51
Held balls obtained by opp	16	17	26	40	3	22	45	79
Recovery of team mates jump ball	23	32	57	53	39	43	119	128
Assists (total)	82	54	197	136	200	133	479	323
Immediate assists	46	29	107	78	106	76	259	183
Secondary assists	36	25	90	58	94	60	220	143
Evaluation points, positive	3325	1995	9592	7225	9247	7225	22164	16447
Evaluation points, negative	237	244	1163	1293	913	1253	2313	2790
Evaluation points, net	3088	1751	8429	5932	8334	5968	19851	13651
Playing efficiency			89.2	84.8	91.1	85.6	90.0	85.0

* 1938 comparison on three final conference games only.

TABLE III

SEASONAL AVERAGES FOR KANSAS VS. OPPONENTS
1938, 1939, AND 1940 SEASONS

	1938*		1939 (8 games)		1940 (8 games)		Total†	
	Kan.	Opp.	Kan.	Opp.	Kan.	Opp.	Kan.	Opp.
Score	42.7	34	40.3	37.1	41.5	30.5	41.5	32.4
Goals attempted	61.5	61.3	72.8	58.6	56.1	57.9	63.4	59.2
Goals made	16.6	13	15.6	12.8	15.6	11.8	16	12.4
Free throws attempted	16	14.7	16.1	14.6	16.6	12.0	16.2	13.5
Free throws made	9.6	8	9	8.1	10.2	7	9.5	7.6
Personal fouls	10.2	12	13	14.3	10.4	15.2	11.2	14.3
Offensive	.8	1	.9	.5	.3	1.1	.5	.8
Defensive	9.4	11	12	13.8	10.1	14.1	10.7	13.5
Violations	3.7	5.3	3.8	3.5	2.6	3.5	3.4	3.8
Rebounds, own backboard	21.2	15	13.9	10.9	11	6.1	15.6	9.5
Rebounds, opp. backboard	22.3	13.3	26.1	22	23.3	15.8	23.8	18
Passes and catches	706.3	364	728.6	546.5	723.4	593.3	718.9	540.4
Immediate assists	13.0	9.7	13.4	9.8	13.3	9.5	13.2	9.6
Secondary assists	11	8.3	11.3	7.3	11.8	7.5	11.3	7.5
Wild passes	7.6	6.7	3.1	4.6	2.8	2.1	4.6	4.4
Fumbles	6.1	6.7	2.9	2.8	1.4	1.1	3.6	2.7
Held ball obtained by opp	3.1	5.3	5	3.3	2.8	.4	3.6	2.4
Positive evaluation pts	1103.3	665	1199	902.9	1155.9	902.9	1150.8	865.6
Negative evaluation pts	73.2	81.3	148.1	161.6	114.2	156.6	109.4	146.8
Net evaluation pts.	1030.1	583.7	1053.6	741.5	1041.8	786	1041.4	718.5
Net eval. pts. per minute	5.2	2.9	5.3	3.7	5.2	3.7	5.3	3.6

* 1938 average includes 9 games for Kansas and 3 games for opponents.
† Total average includes 25 games for Kansas and 19 games for opponents.

8334 net evaluation points as compared to 5968 for the opponents (Table IC). As during the 1939 season, there was little difference in the offensive efficiency but the Kansas team showed a decided advantage in defensive efficiency (64.4 to 41.2) and a better composite efficiency (91.1 to 85.6). In this season, the Kansas team showed a better seasonal percentage for goals and free throws made as compared to the opponents. There was a decided difference in favor of Kansas in personal fouls committed. The home team committed a total of 39 less than the seasonal total for the opposing teams. Kansas made 7 fewer violations and 6 fewer errors in ball handling with a lower percentage of ball handling errors. In fact, both Kansas and the opponents showed a better ball handling record for this season than in the other two studied. In recovery from its own and opponent's backboard, the Kansas team showed a decided superiority (Table II). As during the previous season, in assists the Kansas team showed a greater number than those for the opposition. The home team accomplished a total of 106 immediate assists and 94 secondary assists as compared to 76 and 60 respectively, for the opponents. During this season Kansas totaled 1253 negative points while the total negative points for the opponents was 2313. The opposition was guilty of committing 270 fouls while the Kansas team made but 214. In ball handling errors the Kansas per cent was 1.4 while the per cent for all opponents was 2.1. In violations there was but little difference (66 for the home team and 72 for the visitors). As to the per cent of goals made, there was an advantage in favor of the home team (25.2 to 21.3) as well as in the case of free throws where the percentage was 59.6 to 56.4. Throughout, the home team showed superiority in assists, making a total of 479 to 323 for the opponents. Of the Kansas total 259 were immediate assists while 220 were secondary. The opponents' total for immediate assists was 183 and 143 secondary. In recovering the ball from own backboard, the opponent total was better than that for Kansas (72 to 66), but there was a marked difference in favor of the home team in recovery from opponent's backboard, with 268 for Kansas and 181 for the opposition.

It would seem that the item "error of omission" was entirely too subjective to be included in the study since it was recorded 28 times during the 1938 season, but once during the 1939 season, and not at all during the 1940 season. Even the most experienced observers could not agree upon some of the questions which arose in this respect.

Table IV contains certain pertinent data relative to University of Kansas squad members who played in 6 or more games during each of the 3 seasons in question. At the close of the 1938 season all squad members were ranked in accordance with their scoring ability, number of ball handling errors, and playing efficiency. Without being informed as to the ranking, squad members, freshmen numeral men, and the coaches were asked to rank the varsity squad members as to their of-

† Total average includes 25 games for Kansas and 19 games for opponents.

TABLE IV

SEASONAL RECORDS OF KANSAS SQUAD MEMBERS WHO PLAYED IN SIX OR MORE HOME GAMES DURING THE 1938, 1939, AND 1940 SEASONS

Player	Scoring Ability Index	Minutes Played	Field Goals Attempted	Field Goals Made	Per Cent Field Goals Made	Free Throws Attempted	Free Throws Made	Per Cent Free Throws Made	Immediate Assists	Secondary Assists	Personal Fouls	Net Offensive Evaluation Points	Net Defensive Evaluation Points	Composite Evaluation Points	Evaluation Points per Minute	Playing Efficiency	Ball Handling Errors
1938																	
A, g	24.7	328.5	144	47	32.6	47	28	59.6	17	17	13	1999			6.09	97.2	1.2
B, f, c.	12.9	266	85	23	27.1	30	20	66.7	25	14	8	1302			4.89	92.2	2.9
C, g	6.1	263.5	39	13	33.3	7	5	71.4	10	15	13	1290			5.8	93.6	1.7
D, c	6.5	221.5	50	14	28	8	5	62.5	19	17	17	1250			5.8	94.9	1.8
E, f	4.9	141.5	33	10	30.3	7	5	71.4	11	5	3	559			5.59	90.5	4.6
F, f	4.4	117	67	12	17.9	14	8	57.1	9	4	9	548			6.48	94.1	2.0
G, f, g	1.3	100	20	4	20	4	2	50	6	4	10	460			4.6	94.2	1.1
H, f	5.3	74.5	43	13	30.2	6	4	66.7	6	3	4	344			4.44	93	6.2
1939																	
E, g	9.7	276	75	24	33	10	6	60	11	10	7	1457	205	1662	6	96.8	1.2
C, g	5	227	49	9	18.1	12	9	75	3	11	11	1126	155	1281	5.7	91.6	.5
I, c	3.2	226.5	82	11	13.4	23	9	39.1	15	10	15	1469	-41	1428	6.3	90.3	.4
J, f	14.1	187.5	110	30	28.2	15	13	87.6	8	4	8	953	82	1035	5.5	91.3	1.6
K, f	7.7	150	71	17	23.9	24	13	57.1	14	4	13	718	-49	669	4.5	81.4	2.1
B, f	2.4	140.5	68	8	11.9	13	6	46.1	7	3	7	676	12	688	4.2	90.4	.8
L, f, c	4.2	91.5	24	8	33.3	5	4	80	1	4	1	487	59	546	5.9	97.8	.0
1940																	
I, c	10.5	279	100	25	25	23	14	60.9	30	27	11	1823	81	1904	6.9	32.2	1.9
C, g	10.8	279	52	13	25	18	11	61.1	15	24	20	1518	113	1631	5.7	90.2	2.3
B, f, c	16	248.5	66	26	39.4	28	18	64.3	17	7	6	1034	104	1138	4.7	93.1	2
M, g	.7	219	27	4	14.8	3	1	33.3	5	17	15	835	31	866	3.9	90.1	2.4
K, f	15.3	199	107	29	27.1	27	20	74.1	15	5	16	916	10	926	4.6	87.3	4.1
L, c, g	4.4	167	36	8	22.2	16	9	56.2	7	6	0	703	103	806	4.8	92.2	2.1
J, f	2.8	58.5	22	6	27.3	4	3	75	2	1	1	240	9	249	4.3	94.1	1.3

fensive ability considering the following points: (*a*) scoring ability, (*b*) ability to recover rebounds, (*c*) ability to pass accurately, (*d*) ability to receive the ball on passes, (*e*) ability to recover jump balls, (*f*) ability to avoid held balls. The tabulated data are shown in Table V.

The various subjective ratings compare very favorably with each other, but in several instances differ materially from those computed by the evaluation technique. For example, player B, who was ranked third by the varsity, second by the freshmen and coach, is listed as seventh in ball handling and eighth in playing efficiency by the evalua-

TABLE V

PLAYER RANKINGS FOR VARSITY SQUAD MEMBERS AS TO OPINION OF COACH, VARSITY SQUAD, FRESHMAN NUMERAL MEN, AND RESULTS OF EVALUATION TECHNIQUE (1938 Season)

Player	Position	Varsity Ranking	Freshmen's Ranking	Coach's Ranking	Scoring Ability	Per Cent Ball Handling Errors	Playing Efficiency
A	g	1	1	1	1	2	1
B	f, c	3	2	2	2	7	8
C	g	2	3	3	3	3	2
D	c	4	4	4	4	4	3
E	f	6	6	7	6	12	12
F	f	5	5	5	7	5	6
G	f, g	9	9	9	9	1	5
H	f	10	12	11	5	13	7
I	f	7	8	8	8	11	9
J	f	8	7	6	10	8	10
K	g, c	12	10	10	11	6	4
L	g	11	11	12	13	9	13
M	f	13	13	13	12	10	11

tion technique. Player E ranked as sixth in two instances and seventh in another in the subjective rating, while he was sixth in scoring ability and twelfth in both ball handling and the playing efficiency according to the evaluation study. Player G who ranked ninth in varsity, freshman, and coach's rating and scoring ability, ranked first in ball handling and fifth in playing efficiency.

Of particular interest during the 1938 season is the record of player A who accumulated a total of 1999 evaluation points (based upon 9 games) with a playing efficiency of 97.2 per cent. Not only did this player earn a large number of points in ball handling and field goals and free throws made, but his entire record is relatively free of personal fouls (13), wild passes (5), and violations (2). The scoring ability index of this player, a guard, (24.7) is a much better record for this particular item than that compiled by any other squad member during the three seasons. It is these combined factors which made him one

of the outstanding players for Kansas during the past number of years. During the 1938 season, player E with a high percentage of goals and free throws ranked the lowest in playing efficiency and showed next to the poorest record in ball handling (Table IV). On the other hand, this particular player, a guard, showed the best individual record, as judged on evaluation points of all players, during the 1939 season with 1662 points. During this season, the 205 evaluation points earned by player E set the highest total for two seasons in which they were computed. He was guilty of committing but 7 personal fouls which speaks well for his defensive technique.

The names of but 2 players appear on the records for all 3 seasons. They were player B, who played at forward and center, and player C, who played at guard. The 1938 and 1940 records for player B are easily comparable because he participated much more during those two seasons than in 1939. During 1938 his scoring ability index was 12.9, during 1939 it dropped to 2.4, and in 1940 his record of 16 was the second best individual performance recorded. In this regard player B made the very impressive percentage of 39.4 per cent for goals made in the 1940 season. While this player earned a goodly number of defensive evaluation points and made few fouls, he was only second for the season in placing efficiency because of errors in ball handling. He collected comparatively few evaluation points for passing because he was primarily a receiver and scorer.

The 1939 season was player C's most efficient in ball handling with an error of but 5 per cent. On the other hand, his playing efficiency was better during the 1938 season than for the other two seasons involved. This player ranked second in defensive evaluation points for the 1939 season and first in this respect during the 1940 season. He made an impressive record in secondary and immediate assists particularly during his first and final seasons but his record is marred throughout by an excessive number of personal fouls. During the 1940 season he committed more personal fouls (20) than any player for a single season during the study.

Attention is here called to the record of player I, who accumulated a total of 1428 evaluation points during the 1939 season and the high total of 1904 for the 1940 season, leaving an outstanding record of team play. While his position at center, in the type of offense employed by the Kansas team, enabled this player to accumulate a greater number of points for passes and catches than would be the case at another position, the fact still remains that the possibility of error increases with necessity of handling the ball. In this case the player was successful. During both seasons his error in ball handling is relatively low (.4 per cent in 1939 and 1.9 per cent in 1940). The record of 30 immediate assists and 27 secondary assists during the 1940 season indicates clearly that he was a valuable "team player." This player improved in defensive play as shown by the fact that he had a negative

total of 41 defensive evaluation points in the 1939 season as compared to 81 points in the 1940 season.

The record of player K serves well to illustrate the fact that the value of brilliant scoring can be greatly reduced by ball handling errors and the commission of personal fouls. This player exhibited a scoring ability index of 7.7 for the 1939 season and one of 15.3 for the 1940 games. He compiled a total score of 125 points for the two seasons. On the other hand, he earned but 1595 evaluation points for the two seasons. He ranked only sixth in 1939 and fifth in 1940 in evaluation points per minute and had the greatest ball handling error rate for the 1939 and 1940 seasons (2.1 per cent in 1939 and 4.1 per cent in 1940). In the 16 games he committed a total of 29 personal fouls or about .8 personal fouls per minute of play. The negative total of 49 defensive evaluation points by this player is the poorest record in this respect. His 1940 defensive record of 10 evaluation points showed a decided improvement over the previous season. The outstanding record in scoring coupled with a large number of immediate and secondary assists, could still not compensate for mistakes in ball handling and personal fouls.

CONCLUSIONS

The results of this study indicate rather clearly that much information which could be helpful, and is readily available in basketball games, is not used. It has called attention particularly to certain factors which are apparently important to winning success of a team but receive little recognition. Many of these factors, in the form of mistakes, occur so frequently during the course of the game that they appear to have little effect upon the outcome of the contest. It would seem that the data not only clearly indicate the importance of team play, but recognize the achievements of the player who is an important factor in the scoring by his teammates, though he secures few points himself. This study shows rather well that scoring ability in itself, important as it is, can be readily offset by personal fouls and mistakes in ball handling.

Throughout this study, the players have evidenced a marked interest in the data and have shown a desire to improve their individual ratings. It is the feeling of their coach that the players have not only welcomed this method of evaluating their play, but that they have profited materially from the more complete analysis of the game. It is hoped that this attempt will be preliminary to future studies of the same nature.

Acknowledgment.—Dr. Vernon W. Lapp of Alabama Polytechnic Institute played an important part in the early stages of this study. His efforts have been sincerely appreciated. Due thanks should also be given Roderick Wakeland and Harold Long for their untiring efforts in aiding in the compilation of the data. The kind cooperation of the students who acted as recorders and observers played an important part in making this study possible.

College Hygiene Courses

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MOST hygiene teachers feel that this subject is one of the most difficult to teach and that methods of presentation are still in the developmental stage. Colleges and universities seem to be trying to develop their courses along lines best suited to their particular needs with the result that hygiene is given in a great many different ways. The effects produced are apt to be as diverse. Hygiene students throughout the country are very similar in type and are imbued with the same ignorance, superstitions, and ideals.

These things in mind, a questionnaire was sent to a large number of colleges and universities inquiring into their methods and results with the hope that some answers to the problems which plague all of us might be found. Two hundred sixty-five blanks were returned. The questions treat only with the preliminary hygiene ordinarily given to freshmen.

When the hygiene teacher faces his class he is confronted by a peculiar state of mind in his students. First: They have been taught a little hygiene in high school or the grades by teachers who know little and care less about the subject and who are ignorant of modern medicine. Some of their textbooks have even contained misinformation. Second: Since babyhood they have been imbued with superstitions and false ideas by their families and neighbors. These things are so firmly fixed in their minds that it is very difficult to change them. Third: Many students are not biologically minded and are frightened by three syllable words. Most instructors agree that it is a waste of time to try to teach much anatomy or physiology. Fourth: People as a whole consider preventive automobile mechanics good business but preventive medicine a bore. They have not been sold preventive medicine with the same efficiency that their automobile dealer uses.

Hygiene is offered as a required course in 66 per cent of the colleges, elective in 26 per cent, and both elective and required (by some departments) in 8 per cent.

It is required of males only in 12 per cent, of females only in 26 per cent, and by both in 62 per cent of the coeducational institutions. The course is given to freshmen by 88 per cent, sophomores by 8 per cent, juniors by 2 per cent, and seniors by 2 per cent. When it may be taken in more than one year the lower year only was counted.

The colleges giving hygiene only as an elective were asked to report from which department most of the students came. Students studying

subjects involving the biological sciences or education seem to predominate, the first group probably because hygiene is related to their specialty and the second because some states require hygiene as a prerequisite to a teacher's certificate. The predominant sexes of the elective students were given as male 23 per cent, female 32 per cent, and neither 45 per cent.

Credit is given toward graduation by 90 per cent of the colleges. Several instructors in the schools denying credit report much dissatisfaction among the students because of this. They feel that the course would be taken in a much better spirit if credit were given.

Table I shows the lengths and hours per week of the courses reported. Twice a week for a semester is the most usual. Many instructors feel that it should not be given less than three hours a week because the material cannot be well covered in less.

TABLE I
HOURS A WEEK AND LENGTH

Hours per wk.	2 yr.	1 yr.	2 Quarters	Sem.	1 Quarter	10 wk.	9 wk.	8 wk.	1 wk.
1		37		43	3		1	4	
2	2	14		70	7			1	
3		5	1	48	8	4			
4				3	1				
5					7		1		1
6		1		1	1				

It is interesting to note the number of sections taught at any one time. The number varies from one to 38 and the complete list is given in Table II.

TABLE II
NUMBER OF SECTIONS TAUGHT

No. of Sections	No. Schools Having Them	No. of Sections	No. Schools Having Them	No. of Sections	No. Schools Having Them
1	114	8	8	16	1
2	55	9	7	17	1
3	21	10	1	18	1
4	19	11	1	20	2
5	12	12	1	27	1
6	6	13	1	29	1
7	4	14	1	35	1
		15	2	38	1

The average size of the sections varies greatly, from the small intimate one of 10 to the very large lecture group of 500. It will be noted that the greater number fall below 60. Most instructors who commented on the size of their classes stated that they preferred them to be under 40 but that the college schedules and policies often prevented this. They also said that they believed their teaching efficiency was increased and that the students enjoyed the smaller classes more. Table III shows the distributions according to size.

Among the coeducational colleges and universities, 41 per cent divided them into men and women sections. Opinion seems to be about equally divided on the advisability of segregation according to sex. Typical arguments for coeducational instruction are: "No reason why it should be handled differently than any other class—and this a co-educational institution." "Seems most progressive in an age when there is little sex differentiation in social activity." "No reason for separation into sex groups as we cut no corners and answer all questions."

TABLE III
AVERAGE SIZE OF SECTIONS

Size of Sections	No. Schools Having Them	Size of Sections	No. Schools Having Them	Size of Sections	No. Schools Having Them
10	6	38	5	105	1
12	3	40	20	110	2
13	1	42	2	112	1
15	7	45	13	125	4
16	2	48	1	130	4
17	2	50	24	142	1
18	1	55	1	150	2
20	22	60	14	160	1
22	2	63	1	190	2
23	2	65	4	200	1
25	18	70	3	225	1
26	1	75	4	240	1
28	5	80	4	250	2
30	22	85	2	355	1
32	4	90	2	385	1
35	27	92	1	450	2
36	1	100	5	500	2

The case for the division of sections according to sex may be summed up with: "So we can discuss sex hygiene problems more frankly and thoroughly." "It is felt that the discussions will be more free and the topics need not be the same for the two sexes." "Boys and girls will more freely discuss their problems when not mixed."

In answer to the question about which sex benefited the most from the course, 4 per cent reported that the men did, 7 per cent the women, and 89 per cent said that the benefits appeared to be about equal. Only two instructors stated that they had any disciplinary troubles arising from the type of subject being taught.

Forty per cent of the institutions have the lecture system, 6 per cent give lectures to large groups and divide them into small sections for discussions, and 54 per cent conduct their classes in small groups. Of these having small sections, 8 per cent teach by lecture only, 12 per cent by discussion only, but 80 per cent use the combined lecture and discussion method. Ninety-eight per cent of the instructors allow the students to ask questions freely and only 2 per cent of them report that they have any trouble with "silly" questions. Apparently, in a well conducted class the students would much rather try to find the answers to their own

problems than take up time with questions designed to provoke a laugh.

Following are some comments regarding the methods used (i.e. lecture, discussion, etc.). "Past experience indicates unaided lectures too abstract for non-biology majors. Learning from lectures too transitory." "Women take more interest if responsible for one topic and leading discussion. Dislike typical hygiene textbook. They act less bored than when listening to weekly lectures." "Their Text (or any other that I can find) does not present all of the material I wish them to have so I give them that portion in lecture." "The two formal lectures allow us to cover the material; the one quiz section provides opportunity for informal discussion and check on lecture notes and text, and assignments through quizzing." "I think a student has more interest in a subject when he may participate actively in discussion." "Lectures—to give as much information in the brief time available, and discussions—to promote thoughtful appraisal of health problems and practices."

It is rather interesting to note the backgrounds of the instructors in hygiene and their types of training. The following table shows that only 9 out of 263 schools used an instructor who was not a physician, nurse, biologist, or physical educationalist. Classification is difficult and the heading "M.D. and others" means that most of the instructors are physicians.

TABLE IV
TYPES OF INSTRUCTORS

M.D.	Nurse	Biol.	P.E.	Other	M.D. and Others	Biol. and Others	P.E. and Others
45	11	79	83	9	22	12	2

It would seem from this that because the physical education instructor is so often called upon to teach hygiene, the schools training them should insist that they be very well grounded in the subject. A peculiar situation arises when the college chooses its hygiene instructor; different, perhaps, than in any other study. The physician and the nurse are without doubt the best prepared in the subject matter but later tables will show that the physician knows the least about educational procedures, and as a result, is often a poor teacher. Several colleges report that they were forced to replace the physician instructors with others. I believe that there are three reasons for this: (1) The medical curriculum offers no place for courses in education and most physicians feel that they cannot afford the time to take them later; (2) Most physicians mistakenly assume that their knowledge of the subject is sufficient to make them a teacher; (3) Almost all physicians do not think of their students as very callow youth just out of high school and find that it is difficult to adjust their own methods of thinking to the adolescent level. They seem to think that the students should be of the same maturity and

quality as when they went to school (medical) and become impatient when this high standard is not reached. Naturally, the results are often disastrous.

In order to be a successful teacher of freshman hygiene, therefore, the physician must learn and appreciate the mental training, age, immaturity, point of view, and psychology of his adolescents. The physician must also realize that while he has lived and absorbed medicine (hygiene) constantly for several years until this knowledge is part of himself and seems always to have been known, his students have not and are baffled by seemingly simple facts. One should present his few facts in simple language and leave out the ifs, buts, and maybes which are so dear to the medical man.

That all hygiene instructors will be physicians or nurses is an unattainable ideal. Ideal, because only they have the background for correct interpretation of hygiene; unattainable, because there are very, very few physician-teachers. The only alternative is to train the others as thoroughly as possible in hygiene.

TABLE V
NUMBER OF INSTRUCTORS EMPLOYED

1	instr.	by	185	colleges	7 instr. by	1	colleges
2	"	"	26	"	10 " "	1	"
3	"	"	6	"	14 " "	2	"
4	"	"	4	"	Several " "	34	"
5	"	"	1	"			

Two courses are given entirely by outside lecturers.

TABLE VI
SPECIAL TRAINING IN EDUCATION

M.D.		Nurse		Others	
Yes	No	Yes	No	Yes	No
51 per cent	49 per cent	90 per cent	10 per cent	90 per cent	10 per cent

Eighty-six per cent of the instructors reported that they taught other courses, hygiene being, apparently, a side-issue in many cases.

TABLE VII
OTHER COURSES TAUGHT

Physical Education	106	Marriage Relations	4
Physiology	43	Nutrition	3
Biology	34	Red Cross	3
Anatomy (all types)	31	Sociology	3
Zoology	27	Psychology	3
Advanced hygiene	20	Ecology	1
Bacteriology	19	Entomology	1
Botany	17	Hist. Nursing	1
Embryology	15	Ornithology	1
First Aid	12	Pharmacy	1
Histology	7	Mathematics	1
Genetics	6	Economics and Pol. Sci.	1
Clinical medicine	5	Child study	1
Chemistry	5	Photography	1

Of those colleges employing two or more instructors, 71 per cent reported that their instructors used a basic departmental outline in their teaching. They believe that all of their sections should receive the same instruction on the same subjects. The course outlines are elastic enough to allow for individual preferences, but of sufficient rigidity to ensure proper coverage. Not only is it more fair to the students but it is good practice when the same examinations are given to all sections. There is of necessity some variation in the material given to men and women sections, when such exist, because of varying interests.

Outside lecturers on special subjects have been found to be desirable by 52 per cent of the colleges. The number of times used and the subjects spoken upon are given in Tables VIII and IX.

TABLE VIII
NUMBER OF OUTSIDE LECTURES

1	lect.	in	10	colleges	6 lect.	in	7 colleges
2	"	"	37	"	7 "	"	1 "
3	"	"	32	"	10 "	"	2 "
4	"	"	17	"	20 "	"	1 "
5	"	"	7	"	Several "	"	19 "

TABLE IX
SUBJECTS TREATED BY OUTSIDE LECTURERS

Venereal disease	25	Posture	2
Mental hygiene	24	Medical examination	1
Sex hygiene	19	Disease prevention	1
Tuberculosis	18	Eugenics	1
Dental hygiene	14	Hair and nails	1
Dietetics	13	Hygiene for women	1
Community hygiene	12	Safety	1
First Aid	11	Obstetrics	1
Social hygiene	9	Pediatrics	1
General medicine	9	Hookworm	1
Vision	8	Malaria	1
Marriage	7	Playgrounds	1
Ear, nose, and throat	6	City police	1
Health department	6	Immunizations	1
Communicable disease	5	The family	1
Heart	5	Hair and skin	1
Cancer	4	School hygiene	1
Public Health	4	Pasteurization	1
Sanitation	4	Milk marketing	1
Psychology	3	Dress	1
Personal hygiene	2	Lighting	1
Quackery	2	Current problems	1
Public health nursing	2	Bacteriology	1
Industrial hygiene	2	Respiratory tract	1
Physiology	2	The family doctor	1
Alcohol and drugs	2		

Only 19 per cent of the instructors take their students on field trips to demonstrate some phase of hygiene in actual practice. The most common reason given for not going is supposed lack of material in their communities. Perhaps the list below will give some ideas; the students'

reactions to the trips are: enjoyed 88 per cent, immaterial 12 per cent.

Inquiry into the use of visual aids in the class room shows that 84 per cent of the instructors use it in some form and that 99 per cent of them report that they are of value in teaching. The most common reasons given for non-use are lack of funds and facilities.

The questions on testing methods provoked some rather interesting data and comments. The instructors are almost unanimously agreed that tests are necessary and of some value but the methods of grading seem to be an individual affair or a college system. Twenty per cent use questions on current material in the short class tests, 20 per cent on past material, and 60 per cent on both. Essay questions are used by 7 per cent, objective questions by 38 per cent, and both by 55 per cent. Forty-four per cent use the frequency curve as a basis for arriving at the final grades when the groups are large enough.

TABLE X

FIELD TRIPS

Hospitals	20	Community house	1
Water	19	X-ray lab.	1
Milk	14	Bottling works	1
Sewage	12	Cheese factory	1
Health dept.	8	Ice cream plant	1
Packing house	4	School for blind	1
Tuberculosis lab.	2	Negro sect. of city	1
Bakery	2	Children's inst.	1
Museum	2	State laboratories	1
Tuberculosis sanitorium	2	School system	1
College kitchens	2	Condensary	1
Clinics	2		

TABLE XI

VISUAL AIDS

Charts	105	Posters	5
Movies	110	Microscopic slides	3
Slides	47	Pamphlets	1
Models	43	First aid apparatus	1
Skeleton	15	Reading lamp demonst.	1
Specimens	10	Style floor show	1
Mannikin	8	Laboratory demonst.	1
Film strips	8		

Comments on the value of tests, particularly the short class tests: "Make them prepare daily assignments." "No. Students do not retain material." "Prevents students from loafing." "They start each hour off demonstrating to the student that he doesn't know all about the day's subject." "Students probably prepare more thoroughly because of them." "To see if certain learning processes have gotten across." "Serves as a check on whether material is used and attitudes of students toward their problems." "They present almost the only basis for grading. In addition, however, we call in about 25 or 30 note books

(by a system of our own so the students cannot anticipate it) after every class hour. These we grade rather carefully." "The daily tests are on the assigned reading, therefore, students really study it. The other exams necessitate review of the whole subject matter which helps to make them remember it." "No. No carry-over." "Holds students to specific facts and logical thinking. Discourages superficial generalizations." "Doubtful if any exams are any good."

TABLE XII
TESTING METHODS

	Per cent		Per cent
Final exam only	8	Final and hour exams	18
Hour exam only	3	Final and short exams	30
Short exams only	1	Hour and short exams	2
		Final, hour, and short exams	38

TABLE XIII
NUMBER OF HOUR EXAMS GIVEN

1 by	18 colleges	7 by	1 colleges
2 "	27 "	9 "	2 "
3 "	25 "	10 "	3 "
4 "	33 "	12 "	1 "
5 "	8 "	Several "	1 "
6 "	4 "		

TABLE XIV
NUMBER OF SHORT CLASS TESTS GIVEN

1 by	3 colleges	9 by	4 colleges
2 "	5 "	10 "	12 "
3 "	11 "	12 "	2 "
4 "	15 "	15 "	2 "
5 "	18 "	Daily "	12 "
6 "	13 "	Weekly "	20 "
7 "	2 "	Several "	7 "
8 "	11 "		

Many gave reasons for using the various types of test questions. "(Objective) Ease of grading. However, fail to test students' ability to evaluate. Do test facts. Fair for all." "(Objective) Most practical; students like them; saves time grading where one has large enrollment." "(Essay) Students probably prepare more thoroughly because of them." "(Essay) As Freshmen, they need experience in the assembling of ideas in coherent form and phrased in good English." "(Both) Objective make it possible to sample student knowledge of large amounts of material and are easier to grade. Discussion questions give opportunity to see how completely student can express himself on selected subjects." "(Both) Some students are prejudiced against one type. Combination may test for a larger range of ability and learning. To stress more than one type of problem solving or applications." "(Both) Because some subjects will lend themselves best to either one or the other."

The attitudes of the students toward the course in hygiene are reported as liked by 74 per cent, disliked by 3 per cent, and immaterial by 23 per cent. Only 5 per cent of the instructors felt that the course did not seem to accomplish its purpose.

When the average freshman enters the average college he finds that he is required to take a course in hygiene during his first year. Credit will be granted toward graduation. His class will probably meet twice a week for the semester and will have from 20 to 60 students in it. If he is in a coeducational college, the chances are more than even that the section will also be coeducational. His instructor will endeavor to present the subject from a healthful point of view rather than a mass of physiological facts. He will find that he can ask questions freely and that questions common to all of them will be discussed. The instructor will probably be either a physical education or a biology staff member. Two or three times during the course an outside lecturer will be called in, as a specialist, to discuss subjects of common interest. He probably will not be taken on field trips and, if he goes, it will be to visit one of the utilities or the creamery. Charts and/or movies will be used to explain more clearly some of the basic principles. About once a week the instructor gives a short test and about twice during the semester an hour examination. Of course, the usual final examination will worry him, but he will find when it is all over that he has enjoyed the course and that he will unconsciously carry some of the principles of hygiene into later life (we hope).

Many fine suggestions were received discussing methods of teaching, but space will permit the printing of only a few.

"The scheme I have invented of selecting from all sorts of our best contemporary literature articles which I assign to individual students who stand up and give them before the whole class seems to brighten up the entire procedure of every class hour. I call for the report at the beginning of each hour. Some reports are poorly given, but most of them are well presented and they are listened to with attention and respect. A few moments' discussion, partly by the teacher, and partly by members of the class follows. Then I take up the topic for the day. Very rarely do I refer to the text book. There is no use going over what is printed there. The students know that they are held responsible for the whole book. They have to abstract it chapter by chapter into their note books and it is a big stiff text book including personal and community hygiene. I refuse to use the same book two years in succession, believing that that would be bad for the student and bad for the teacher. I do a great deal with mental hygiene and am not afraid of psychiatric problems. Modern courses in hygiene should include health of body, mind, and spirit. There is always a great deal more material to be put into the course than time permits. We call in five town doctors to speak to each class upon their specialties."

"(We have a) list of health topics from which students make choice of topics. These preferences are then tabulated and our outline is made up accordingly. However, the sequence of topics is not strictly adhered to as we feel that timeliness of presentation is important in health teaching."

"This course is taught with the idea in mind of giving a sound basis for wishing to maintain health. Students are taught all ten systems of organs and the physiology of each. We do not spend our time on old fashioned physiology and hygiene which dealt with many insipid lessons, each with its own moral. We try to give them something with meat to it. Otherwise hygiene is of no value to the student and a teaching burden to the instructor."

"The problem of teaching hygiene is enormously difficult under the best of conditions. It is also tremendously important. I feel the curriculum, schedule, etc. of any college should be arranged to give hygiene at least an even break with other academic courses. I believe instructors of hygiene should keep aware of students' needs, what they want information on, and I believe everything possible should be done to make it a live course and one which is applicable to daily campus life as well as one which helps develop and shape attitudes which will help in later situations in which the student may find himself."

Anthropometry of Young Women

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INTRODUCTION

IN RECENT years there has been considerable emphasis on the degree and kind of relationships which may exist between the metric and morphologic body attributes and body functions in health and in disease. The former usually are termed constitutional and/or racial factors and are believed to be derived mainly through the hereditary mechanism. The latter are known to be strongly influenced by nurtural circumstances of many kinds. The problem then is essentially one of nature-nurture and the analysis directed at the types and extents of variability produced by the one or the other or by the associative interaction of the two.

The present data were collected primarily for the purpose of examining some of the factors in the above stated problem. Since it is also important to know from time to time facts about populations, the present report is concerned only with the descriptive presentation of some metric and morphologic facts from a representative sample of entering freshman girls at the University of Michigan during the years 1937, 1938, and 1939. The omission of comparative data is intentional. The discussion is purposely limited since the facts are contained in the tables. The only exclusions in the data are members of other than the white race. The relationship of nationality to the various measures and observations as well as the many kinds of inter-associational arrays and configurations are problems beyond the scope of this presentation. To summarize—the present purpose is the descriptive presentation of metric and morphologic attributes of the female population drawn from entering freshman girls at the University of Michigan from 1937–1939.

ANTHROPOMETRY

The Sample.—Anthropometric measurements and observations were made on 1702 girls during the three observation periods in the fall of 1937, 1938, and 1939. Since no differences, other than those attributal to the sampling process, are shown in the sub-series, the three samples are grouped together as a single sample unit. The measurements —weight, stature, sitting-height, biacromial, bi-iliac, head length, head breadth, head height, face breadth (bizygomatic), bigonial, face height (nasion-menton), nose height, and nose breadth—conform in definition

and in measurement technique to the usually accepted anthropometric requirement.[1] The observational classification for morphologic attributes depended upon the judgment of the anthropometrist. The internal reliability of these attributes is adequate; comparative differences may be large.

Measurements.—The statistical constants, number and range, and the mean, the standard deviation, the coefficient of variation and their respective probable errors descriptive of the measurements and derived indexes [2] are recorded in Table I. Although the age range is large, the majority of individuals fall between the ages 17–19 years and the standard deviation of age (1.11) is small. The correlations (Pearson's product-moment) between age and other measurements and indexes statistically are insignificant, consequently correction for age is unnecessary and the measurements are representative for this population of girls at average age 17.79 years. The amount of variability in weight is rather high, especially in contrast with the somewhat low variation in other measures. Stature is not conspicuous. The contribution made to stature by sitting height is below expectation for females. This is reflected in the low relative sitting height which is more suggestive of male than of female proportions. The same trend of evidence obtains for biacromial and bi-iliac diameters and the shoulder-hip index. The biacromial diameter is larger and the bi-iliac diameter slightly smaller than expected in a random female population. The resultant shoulder-hip index tends toward "maleness" or "athleticness." No unusual features are indicated either in the means or in the distributions of head length, head breadth, cephalic index, or head height. The only measurement in the facial region suggestive of difference is the bigonial diameter, which is a little under the average for females.

In summary, then, the measurement and indicial data on this sample of females indicates them to be less variable than females in general and shows in the bodily measurements and indexes a rather marked tendency toward maleness or athleticness of type.

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[1] Rudolf Martin, *Lehrbuch der Anthropologie* (2nd ed., Jena, 1928) Vol. I.

[2] The indexes are:

$$\text{relative sitting height} = \frac{\text{stature}}{\text{sitting height}} \times 100$$

$$\text{shoulder-hip index} = \frac{\text{bi-iliac}}{\text{biacromial}} \times 100$$

$$\text{cephalic index} = \frac{\text{head breadth}}{\text{head length}} \times 100$$

$$\text{facial index} = \frac{\text{face breadth}}{\text{face length}} \times 100$$

$$\text{zygo-gonial index} = \frac{\text{bigonial}}{\text{face breadth}} \times 100$$

$$\text{nasal index} = \frac{\text{nasal breadth}}{\text{nasal height}} \times 100$$

TABLE I
MEASUREMENTS AND INDEXES

Trait	Number	Range	Mean±P.E.	St.D.±P.E.	C.V.±P.E.
Age	1627	15–30	17.79±0.02	1.11±0.01	6.42±0.08
Weight	1490	70–229	124.00±0.31	17.70±0.22	14.27±0.18
Stature	1489	140–178	162.79±0.10	5.54±0.07	3.40±0.04
Sit. hgt.	1485	69–94	86.18±0.05	3.10±0.04	3.60±0.04
Rel. sit. hgt.	1485	47–57	50.16±0.04	2.18±0.02	4.31±0.04
Biacromial	1472	28–44	35.78±0.03	1.67±0.02	4.67±0.06
Bi-iliac	1472	22–38	28.08±0.03	1.81±0.02	6.45±0.08
Sh. hip ind.	1472	67–101	78.03±0.09	4.86±0.06	6.23±0.08
Head lgt.	1472	165–203	185.39±0.11	6.27±0.08	3.38±0.04
Head brd.	1472	125–163	145.45±0.09	5.10±0.06	3.53±0.05
Head hgt.	1440	106–141	124.79±0.10	5.76±0.07	4.62±0.06
Cephalic ind.	1472	68–98	78.78±0.10	5.83±0.07	7.40±0.10
Face brd.	1460	117–152	130.19±0.08	4.80±0.06	3.69±0.05
Face hgt.	1461	96–132	112.60±0.10	5.49±0.07	4.88±0.06
Face index	1460	70–105	84.93±0.10	5.85±0.07	6.89±0.09
Bigonial	1471	80–116	95.70±0.08	4.68±0.06	4.89±0.06
Zyg.-gon. ind.	1460	64–85	73.55±0.06	3.36±0.04	4.56±0.06
Nose hgt.	1472	30–66	50.60±0.06	3.66±0.04	7.23±0.09
Nose brd.	1457	25–42	31.34±0.04	2.16±0.02	6.89±0.08
Nose index	1457	50–82	60.77±0.10	5.73±0.07	9.43±0.12

Observations.—Observations upon the pigment features of skin, hair, and eyes are recorded in Tables II, III, and IV. The pigment range for the three observational categories coincides with that expected for the general "white" division of mankind. The absence of heavy pigmentation in skin, hair, and eyes also is expected since the majority are of old American or of North European ancestry.[3] The high percentage of mixed eyes is indicative of considerable racial heterogeneity.

TABLE II
SKIN COLOR

	Number	Per Cent		Number	Per Cent
Pale	29	1.97	Swarthy	21	1.43
Pink	681	46.29	Light brown	6	0.41
Light brunet	533	36.23	Med. brown	4	0.21
Med. brunet	144	9.80			
Dark brunet	53	3.60	Total	1471	100.00

TABLE III
HAIR COLOR

Color	Number	Per Cent	Color	Number	Per Cent
Red	34	2.31	Light brown	452	30.67
Ash	39	2.65	Med. brown	350	23.74
Gold	60	4.07	Dark brown	124	8.41
Ash-brown	264	17.91	Black	15	1.02
Gold-brown	102	6.92			
Red-brown	34	2.31	Total	1474	100.01

[3] Comparable figures from a non-university sample of the female population (Hughes—unpublished) reveal the university group to be considerably less brunet and less variable in pigment features than the non-university group.

TABLE IV
EYE COLOR

Color	Number	Per Cent	Color	Number	Per Cent
Blue	61	4.56	Brown+++-blue	163	12.17
Blue-gray	303	22.63	Brown++++-blue	38	2.84
Blue+++-brown	333	24.87	Brown	171	12.77
Blue++-brown	144	10.75			
Blue—Brown	126	9.41	Total	1339	100.00

* Blue+++—brown refers to an eye that presents a trace of brown and that is otherwise blue or gray blue. Blue++—brown presents an iris about four-fifths blue or gray-blue. Blue—brown indicates equal amounts of brown and blue. Brown+++—blue shows just a trace of blue or gray-blue.

Hair form, texture, and amount is shown in Table V. Natural waviness of hair (deep wave, curly) is found in approximately one-fourth of girls. The texture is predominantly medium to fine and excessive amount of head hair is characteristic. No evidence of pattern (genetic or hereditary) baldness was found.

TABLE V
HAIR FORM, TEXTURE, AND AMOUNT

A. Form	Number	Per Cent	B. Texture	Number	Per Cent
Straight	30	2.05	Coarse	149	10.21
Low Wave	1046	71.35	Medium	760	52.05
Deep Wave	378	25.78	Fine	551	37.74
Curly	12	0.82			
Total	1466	100.00	Total	1460	100.00

C. Amount	Number	Per Cent
Small	12	0.84
Medium	620	43.54
Pronounced	792	55.62
Total	1424	100 00

The observations on the various features of the nose are contained in Table VI. Medium to submedium nasal root height and medium nasal bridge height is characteristic. Both the root and bridge are narrow. The nasal profile is usually straight with concave and convex forms moderately frequent while the nasal tip tends more toward smallness than toward heaviness. The variability in nasal features, like that of the eyes, is suggestive of racial heterogeneity.

Cranial and facial asymmetries are listed in Table VII. Cranial asymmetries are limited. The incidence of facial asymmetry, however, is high with a rather heavy emphasis of left over right asymmetry.

Body build is generally medium (athletic) with laterality more frequent than linearity (Table VIII). The observation on body build is substantiated by the measurements.

TABLE VI

NASAL FEATURES

A. Root Height	Number	Per Cent	B. Bridge Height	Number	Per Cent
Very low	36	2.31	Low	315	21.49
Low	453	29.06	Medium	870	59.34
Medium	879	56.38	High	281	19.17
High	191	12.25			
Totals	1559	100.00	Totals	1466	100.00
C. Root Breadth	Number	Per Cent	D. Bridge Breadth	Number	Per Cent
Small	888	55.46	Small	876	59.75
Medium	613	38.29	Medium	546	37.24
Large	100	6.25	Large	44	3.01
Total	1601	100.00	Total	1466	100.00
E. Nasal Profile	Number	Per Cent	F. Tip Thickness	Number	Per Cent
Concave	269	17.19	Small	448	30.85
Straight	940	60.06	Medium	686	47.25
Convex	356	22.74	Large	318	21.90

TABLE VII

ASYMMETRIES

A. Cranial	Number	Per Cent	B. Facial	Number	Per Cent
Absent	1140	95.24	Absent	862	58.76
Left	37	3.09	Left	358	24.40
Right	20	1.67	Right	247	16.84
Total	1197	100.00	Total	1467	100.00

TABLE VIII

BODY BUILD

	Number	Per Cent
Linear	273	18.63
Medium	851	58.09
Lateral	341	23.28
Total	1465	100.00

The Relationship between Certain Phases of Kinesthesis and Performance During the Early Stages of Acquiring Two Perceptuo-Motor Skills

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INTRODUCTION

COACHES and psychologists seem uniformly to agree, principally on *a priori* grounds, that efficient kinesthesis is essential to refined motor performance. Although not as conclusively as might be expected, studies do indicate a tendency for the more skilled performer of specific manual tasks to test higher on traditional kinesthetic tests than does the less skilled individual.[5, 11, 24] * On the other hand, however, manual guidance has been shown to be decidedly inferior to visual guidance in learning to reproduct given maze patterns,[15, 26] and there is evidence that, with animals, motor patterns do persist [12] and learning can take place [8] even after the kinesthetic sense has been rendered at least partially ineffective, i.e., by sectioning of the spinal cord, and that maze learning is impossible with none other than kinesthetic cues available.[7]

PROBLEM

Essentially, the study reported here was an attempt to determine the relationship which obtains between kinesthesis, as measured by certain tests, and performance during the early stages of acquiring two perceptuo-motor skills which closely simulate the "putt" and the "drive" in golf. Out of this particular problem, however, at least two additional problems arose. The first involved the necessity to discover more about the nature of kinesthesis, i.e., to learn whether the ability to perceive bodily movement and tension manifested in the kinesthetic tests used in the study depends upon a general factor or whether it is specific to the particular stimulus patterns involved in the tests. The second problem involved the determination of the predictive values of any of the tests or combination of tests which might be related to early performance in the two skills.

This paper is an abstract of a dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at The Pennsylvania State College, State College, Pennsylvania, August, 1941.

* Superior figures refer to the Selected References at the end of this paper.

TERMINOLOGY

For the purposes of the study, *kinesthesis* was defined as the process of cognizing bodily tension and/or movement on the basis of what one is doing, or in terms of their (tension and movement) relation to some contemplated mode of behavior, sensations of which are received through any or all of the mechanical senses.

The two *perceptuo-motor skills* involved in the study were (1) playing a 10-foot putt on a level surface with a regulation golf ball and a regulation putter in a manner similar to putting in the game of golf, and (2) playing a regulation golf ball for accuracy at a target 18 feet from the tee with a regulation brassie in a manner similar to driving in the game of golf.

SUBJECTS

The population involved consisted of 63 freshman and sophomore male students enrolled in The Pennsylvania State College during the academic year 1940–41. Characteristic of the universe of college men, the subjects were quite heterogeneous as regards standing height, weight, grip strength, intelligence, experience in and interest in motor activity. The distribution of their chronological ages ranged from approximately 16 to 24 years. All subjects were right-handed and none of them had ever played golf in any form prior to the experiment.

PROCEDURES

The major steps taken in collecting the data were:

1. The first administration of the battery of ten kinesthetic tests—approximately 75 minutes per subject.
2. The second administration of the same tests—approximately three weeks later for each subject.
3. The collection of descriptive data on the subjects such as: chronological age, standing height, weight, intelligence, and grip strength.
4. Instruction and recording of performance in putting—2 one-hour periods per week for four weeks.
5. Instruction and recording of performance in driving—2 one-hour periods per week for four and one-half weeks.

The major steps taken in statistically analyzing the data were:

1. Determination of the central tendencies, variabilities, and reliability coefficients of the variables.
2. Determination of the relationships among the variables.
3. Determination of the relationships between each of the five more reliable tests of kinesthesis and each of the two perceptuo-motor skills, with such factors as chronological age, body build, intelligence, and grip strength held statistically constant by the means of partial correlation.

4. Determination of the multiple correlation coefficients between a team of four kinesthetic tests and each of the two perceptuo-motor skills.

The experimental period lasted approximately five months. The experimenter did all of the testing, teaching, and recording of data. The kinesthetic tests were administered individually and the skills were practiced in eleven groups of six subjects each. All testing and teaching

Fingers Together (Test No. 1)

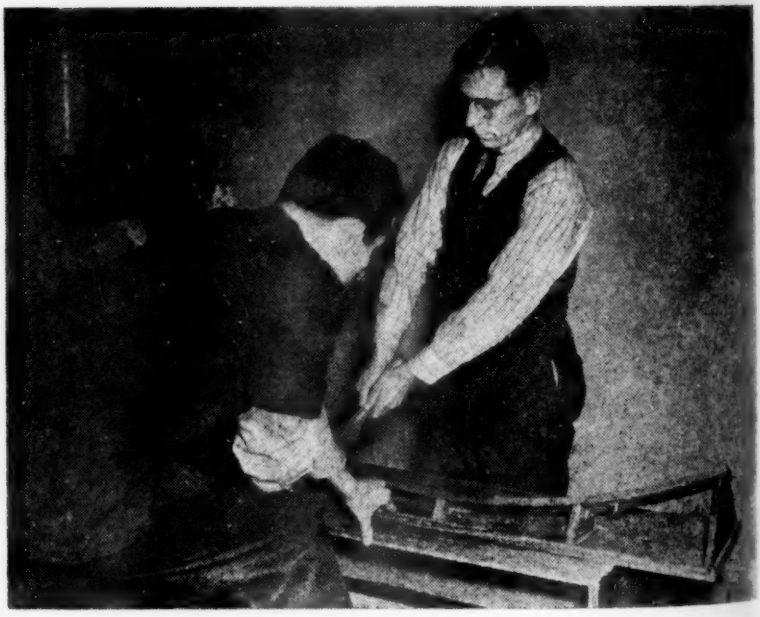
Putter Target (Test No. 10)

was done in the same laboratory and every effort was made to maintain constancy in the amount and quality of instruction and practice as well as in conditions under which each subject worked.* No practice whatsoever was permitted outside of the laboratory.

Kinesthesis was measured by a battery of ten tests, many of which were original with the study, most of which were adapted in part from those tests traditionally used to measure this particular sense modality. All tests were taken while the subjects were blindfolded (see illustrations), practice trials were allowed on eight of the tests, the subjects were permitted to use their own work methods, but no knowledge of results was given on either practice or test trials. The tests were numbered and named as follows:

* In 98.6 per cent of the subject-periods each subject practiced with five other subjects in the group and with either two- or three-day interims between practice periods. Moreover, all sections were shown to exhibit approximately the same level of performance in the two skills.

Arc Pairs—Right Hand (Test No. 4)



Arc Swing (Test No. 7)

Pouring Sand (Test No. 6)

Pathway—Left Hand (Test No. 9)

Test 1 (Fingers Together).—The subject attempted to bring the two index fingers together in front of the body at about waist height.

Test 2 (Weight Pairs).—The subject attempted to discriminate between pairs of weights.

Test 3 (Foot Span).—The subject attempted to reproduce a preferred distance between the heels.

Test 4 (Arc Pairs—Right Hand) and *Test 5 (Arc Pairs—Left Hand).*—The subject attempted to discriminate between the curvature of pairs of arcs.

Test 6 (Pouring Sand).—The subject attempted to equalize the weight of two containers (one held in each hand) by pouring sand from one to the other.

Test 7 (Arc Swing).—The subject attempted to reproduce a swing of a standard distance to the right and left, the arms swinging in a plane in front of the body at a 60° angle with the horizontal.

Test 8 (Pathway—Right Hand) and *Test 9 (Pathway—Left Hand.)*—The subject attempted to move a stylus through a winding pathway in the least possible length of time.

Test 10 (Putter Target).—The subject attempted to strike a target with a pointer attached to the face of a golf putter head.

Only two of the ten kinesthetic tests showed a notable practice effect at the time of the re-tests. They were the two "pathway" tests which were also found to be the most reliable. The apparent absence of an appreciable practice effect from the tests to the re-tests can perhaps be accounted for by either or both of the following explanations: (1) any learning which had occurred during the first administration had been forgotten by the time of the re-tests, and (2) the subjects, not knowing the results of the first tests had received no cues which would enable them to make adjustments for certain constant errors. As regards the improvement on the "pathway" tests, it would not seem unreasonable to postulate that the subject learned certain approaches during the first testing which were refined with the additional practice.

Owing to the low reliability of certain of the kinesthetic tests, only Tests 1, 7, 8, 9, and 10 were used in the analysis of relationships. The reliability coefficients of these five tests ranged from .59 to .84. The reliability coefficients of putting and driving were .64 and .85 respectively.* Owing to the fact that in determining relationships all measures of ability on the kinesthetic tests represented the combined performances on the tests and re-tests, the reliability coefficients of the tests were determined by correlating one day's scores with those of a second day and stepping up the resulting coefficients by means of the Spearman-Brown formula for predicting the reliability of a test of doubled length.[16:194] † Because the measures of ability in the golf skills

* Performance in these two skills was measured by means of targets which indicated the amount of error in two directions.

† N = 73

represented the average performance on the last four days of practice in each skill, "consistency of performance" in these skills was determined by stepping up the correlation coefficients obtained by correlating the average of two days' performances with that of two other days' performances.

The population as a whole showed steady improvement in both perceptuo-motor skills but individual performance was characterized by much fluctuation. Fully one-third of the subjects made poorer scores in driving at the end of the instruction period than they had made during the first week of practice. It is possible that this might have been due to the fact that after individuals found rather early that they could contact the ball by swinging, as they should, they developed a tendency to "hit at the ball" in order to get more power, thereby altering the pattern of movement which resulted in a loss of accuracy.

Whereas verbal instruction, as contrasted to demonstrational instruction, appeared to have a confusing effect on some subjects during the first few periods of practice, it showed a noticeable increase in importance as practice continued. By and large, therefore, observation of learning to drive a golf ball tended to support studies made at the University of Wisconsin which indicated that the value of demonstration lies chiefly in the first few trials and that after a small amount of improvement, demonstrations cease to have much value whereas verbal instructions increase in importance.[17:68] This apparently inhibitory influence of verbal instruction during the early stages of learning and with certain types of skills has also been suggested elsewhere.[18:866]

ANALYSIS OF RELATIONSHIPS

Interrelations.—With one exception, the intercorrelation coefficients among the five kinesthetic tests used in the analysis of relationships ranged from—.09 to .18, six of them exhibiting essentially zero relationship (Table I). The one exception, .72 between performance with the right hand versus that of the left hand on Tests 8 and 9 where the object was to move a stylus through a winding pathway, is in agreement with the findings of other studies on bilateral transfer of motor skill [29:183 ff] and tends to support Seashore, Buxton, and McCollom's conclusion, ". . . that shifting from one musculature to another makes little relative difference in performance, while keeping the musculature constant and shifting to another pattern of action makes a great deal of difference in correlations." [22:258]

Partial Correlation Coefficients.—The partial correlation coefficients in Table II show the relationships between each of the five more reliable tests of kinesthesis and the two criteria with the factors of

TABLE I

ZERO-ORDER CORRELATION AMONG THE VARIABLES *

No.	Variable	Variable (Number) 2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1.	Putting	.300	—.085	.153	—.383	—.190	.327	.060	—.266	.035	.045	.026
2.	Driving		—.002	.108	—.174	.104	.274	.199	—.127	—.052	—.158	.026
3.	Kinesthetic test 1 (Fingers together)	—.022		.163	.011	—.055	—.094	.024	—.049	.243	.096	—.033
4.	Kinesthetic test 7 (Arc swing)	.108	.163		.014	—.020	.175	.228	.014	.101	.062	.016
5.	Kinesthetic test 8 (Pathway—right hand)	—.174	.011	.014		.715	—.051	.033	.133	—.024	—.089	.180
6.	Kinesthetic test 9 (Pathway—left hand)	.104	—.055	—.020	.715		.159	.139	.039	—.037	—.187	.060
7.	Kinesthetic test 10 (Putter target)	.274	—.094	.175	—.051	.159		.080	.020	.055	—.063	.074
8.	Chronological age	.199	.024	.228	.033	.139	.080		.176	—.108	—.462	.176
9.	Body build	—.127	—.049	.014	.133	.039	.020	.176		—.062	—.152	.230
10.	"Space factor"	—.052	.243	.101	—.024	—.037	.055	—.108	—.062		.436	.080
11.	Mental ability	—.158	.096	.062	—.089	—.187	—.063	—.462	—.152	—.436		—.005
12.	Grip strength	.026	—.033	.016	.180	.060	.074	.176	.230	.080	—.005	

† The intercorrelation coefficients among the five kinesthetic tests are within the rectangle.

* The standard error of an r of zero is .127 when computed from a sample of 63 cases.

chronological age, body build,* intelligence as measured by two tests,† and grip strength held statistically constant.

An examination discloses first of all that the correlation coefficients are arithmetically larger in every instance between the kinesthetic test scores and putting than they are between the test scores and driving. This suggests the hypothesis that the kinesthetic tests measure, at least to some extent, a phase of perception of movement in putting which is not necessarily essential to success in the early stages of learning to drive a golf ball as measured by the techniques used in this study. An

TABLE II

CORRELATION OF THE KINESTHETIC TEST SCORES WITH PERFORMANCE IN THE PERCEPTUO-MOTOR SKILLS*

Test		Putting	Driving
No. 1 (Fingers together)	Zero-order r	—.085	—.002
	Corrected r†	—.135	—.003
	Partial r‡	—.114	—.004
No. 7 (Arc swing)	Zero-order r	.153	.108
	Corrected r	.239	.146
	Partial r	.136	.083
No. 8 (Pathway—right hand)	Zero-order r	—.383	—.174
	Corrected r	—.522	—.206
	Partial r	—.382	—.183
No. 9 (Pathway—left hand)	Zero-order r	—.190	.104
	Corrected r	—.271	.129
	Partial r	—.203	.069
No. 10 (Putter target)	Zero-order r	.327	.274
	Corrected r	.532	.387
	Partial r	.340	.267

* The standard error of a zero-order r of zero is .127 when computed from a sample of 63 cases. It is .126 when considering partial r's. (16:153 & 244)

† The zero-order r corrected for attenuation. (16:203)

‡ The factors of chronological age, body build, intelligence as measured by two tests, and grip strength were held statistically constant by the method of partial correlation. (16: Chapter VIII)

analysis of the two golf skills tends to support this assumption, i.e., these kinesthetic tests principally involve movements of the arms rather than those of the larger muscles of the back and legs which appear to function to a greater extent in driving a golf ball than they do in putting.

A second observation seems to indicate that although the relative predictive value of a test is not necessarily dependent upon the pattern of movement involved, there are rather definite indications that the more closely a kinesthetic test simulates putting, the greater is the

* Body build was determined by dividing the cube root of the weight in kilograms by the height in centimeters.[10]

† The two tests were the *Otis Self-Administering Tests of Mental Ability, Higher Examination: Form A* and the "Space Factor—Cards and Figures" Test of Thurstone's *Tests for Primary Mental Abilities.*

† The intercorrelation coefficients among the five kinesthetic tests are within the rectangle.

tendency for subjects standing high in that test to show better performance in putting during the early stages of learning. As will be shown later, the arithmetically largest correlation coefficient is negative and although the kinesthetic test involved, Test 8 (pathway—right hand), appears to be most dissimilar in movement to putting, it is, nevertheless, the most promising from the standpoint of prediction. Test 10 (putter target), though, shows the highest positive relationship with both skills and it will be recalled that this test was one wherein a golf putter was used and in which the movement somewhat simulated that which one executes when taking a position in preparation for the putting stroke itself. Test 7 (arc swing) shows less tendency for the better performers to acquire ability to putt more readily while Test 1 (fingers together) indicates a possible trend in the reverse direction, a trend more clearly apparent in Test 8 (pathway—right hand) where there appears a definite tendency for the poorer performer to learn to putt better, at least in the early stages of learning. Results with respect to driving only roughly approximate the findings obtained with putting, however.

If it be assumed to start with that there is zero relationship between each of the five kinesthetic tests and putting and driving, i.e., if we assume the null hypothesis, the problem becomes one of confirming or refuting this assumption. Table II shows that of the ten partial correlation coefficients, only one is more than three times the standard error of a zero correlation coefficient involving 63 cases. In this case, therefore, the null hypothesis is refuted for the odds appear to be approximately 820 to 1 that a correlation coefficient as arithmetically large as that found between the Kinesthetic Test 8 (pathway—right hand) and putting (—.382) would not obtain if there were zero relationship between the two measures.* The conclusion, therefore, that there exists a low relationship between the two in the direction indicated by the sign in the sample can be supported.†

At least two explanations seem plausible in attempting to account for this negative relationship, (1) that success in moving the stylus through the pathway might suggest reliance on certain kinesthetic stimulus patterns which favor work methods not suited to rapid learning of putting,‡ and (2) that the kinesthetic test performance was enhanced by an analytical approach which would, in all probability, impede progress in a skill where it is quite possible that concentration should be placed

* It must be remembered that the procedure of quoting odds that certain relationships exist involves the assumption that the r's of additional samples would be normally distributed. This, however, cannot strictly be true for r's can never be "infinite" in size. They must always lie between $+1.00$ and -1.00.[16:117]

† It will be noted, however, that the odds are only approximately 13 to 1 that a similar relationship exists between this kinesthetic test and driving; they are approximately 18 to 1 that the relationship exists between Test 9 (pathway—left hand) and putting.

‡ Seashore discusses quite adequately the importance of work methods in contributing to individual differences in performance and of their influence on future performance.[20]

on the end result. At first, these tentative explanations appear to be one and the same thing since they both actually refer to work methods, but a closer examination will reveal that the first pertains more to specific motor patterns which have become habitual with the individual whereas the second has reference more to cognitive aspects of a Gestalt or the orientation of the individual to each task. Apparently there is involved here what Woodworth calls *associative interference*, i.e., "practicing one act makes the *learning* of another more difficult." [29:228]

With respect to the Kinesthetic Test 10 (putter target), the test which shows the highest positive relationship with both skills, the odds are approximately 285 to 1 that the correlation coefficient obtained between this test and putting would not have arisen if the true relationship between the two were zero. They are 58 to 1 that a similar relationship exists between success on the same test and early success in driving. These results, as those obtained by correlating performances on Test 8 (pathway—right hand) and Test 9 (pathway—left hand), seem to support Seashore's conclusions concerning the importance of pattern of movement although here there would also appear to be similarity in musculature involved.[21:98]

The odds appear to be only 6 to 1 that the correlation coefficient obtaining between the scores made on the Kinesthetic Test 7 (arc swing) and performance in putting is not a result of chance. They are only approximately 4 to 1 that the null hypothesis does not hold with respect to the relationship between Test 1 (fingers together) and putting.

Zero-Order and Multiple Correlation Coefficients.—An examination of the zero-order correlation coefficients in Table II shows that in each case the coefficient is not of sufficient size to indicate that the measures are related closely enough to warrant the prediction of individual scores in one measure from standing in the other.* The arithmetically largest correlation coefficient (—.383), that involving the Kinesthetic Test 8 (pathway—right hand) and putting, reduces the error in predicting individual scores only approximately 7.5 per cent over that involved in chance prediction. It is well to remember, however, that this is the percentage of reduction in error of predicting individual scores for *all* individuals, for a correlation coefficient of —.383 does aid to a certain extent in classifying those individuals in either tail of the distribution into two skill groups.[27:75] For example, the odds are approximately 3 to 1 that subjects standing in the *upper* tenth in performance on Kinesthetic Test 8 will be found in the *lower* half in performance

* The correlation coefficients corrected for attenuation are presented in Table II in order to suggest the "theoretically maximum" correlation which could be expected to obtain between the measures if each were perfectly reliable. These, however, involve certain assumptions which may or may not be tenable in this study. (See Henry E. Garrett, *Statistics in Psychology and Education*, p. 336 f.)

in putting during the early stages of learning.* On the other hand, the odds are approximately 2.5 to 1 that subjects standing in the *upper* tenth on Test 10 (putter target) will be found in the *upper* half in performance in putting and 2 to 1 that they will be found in the *upper half* in driving. Conversely, those in the *lower* tenth in performance on this same test will about two out of three times be found in the *lower* half in putting and in driving.

A combination of four of the tests by means of the multiple correlation technique makes it possible, approximately to double the reduction of error in prediction of early learning in putting over that prediction which is possible from scores on the Kinesthetic Test 10 alone. That is, a team made up of Tests 7 (arc swing), 8 (pathway—right hand), 9 (pathway—left hand), and 10 (putter target) correlates with performance in putting to the extent of .505. The same battery of tests gives a multiple correlation coefficient of .422 when correlated with early performance in driving. Therefore, the odds are nearly 5 to 1 with respect to putting and approximately 3.5 to 1 with respect to driving that subjects standing in the upper tenth in performance on the battery of four kinesthetic tests will be found in the upper half of the group in performance in these two perceptuo-motor skills during the early stages of learning.

In combining these tests in order to predict early learning in putting and driving, each test is weighted in accordance with the partial regression coefficients which relate performance on the criterion with each kinesthetic test in turn when the influence of the other three tests is held constant and when the tests are measured in units of equal variability.[16:230] The relative weights of each test in contributing to success in putting and driving are shown in the following regression equations which are expressed in standard score form: [16:233]

$$\overline{Z}_p = .1122\, Z_7 - .4194\, Z_8 + .0684\, Z_9 + .2750\, Z_{10}$$
$$\overline{Z}_d = .0927\, Z_7 - .4562\, Z_8 + .4051\, Z_9 + .1700\, Z_{10}$$

where the subscripts refer to putting, driving, and kinesthetic test numbers.

An examination of these two regression equations shows that Kinesthetic Test 8 (pathway—right hand) contributes relatively more in predicting, and therefore presumably in .explaining, success in early learning in putting *and* driving than does any other test in the team although it will be observed that in predicting success in either of these skills, the subject is penalized for making a good score on the kinesthetic test. It has been pointed out that Test 10 (putter target) is more closely related to early putting than any of the other tests

* See reference 16, Table LI, p. 508, for the "prediction of an individual in a dependent measurement from his standing in an independent one."

except Test 8 but an interesting phenomenon appears in the fact that, as evidenced in the second regression equation, Test 10 does not contribute as much to the team in the prediction of success in early driving as does Test 9 (pathway—left hand). In attempting to account for this, it seems rather plausible to attribute the relatively small contribution of Test 10 to the fact that it involves a type of movement which does not simulate very closely the type of movement involved in driving, at least not nearly as closely as it simulates putting.

On the other hand, the relatively large contributions of both "pathway" tests to driving can hardly be attributed solely to similarity or dissimilarity of pattern of movement involved. Although, as suggested before, pattern of movement might account for some of the relationship, particularly the negative relationship, an explanation here seems to involve the amount of kinesthetic perception actually available in each upper extremity. In driving a golf ball, for example, it is fairly well agreed that emphasis should be placed on the left arm with the right arm serving essentially as a guide. In this experiment, driving was taught with this same emphasis on the use of the left arm. Is it not logical to propose the hypothesis, therefore, that the relatively high positive partial regression coefficient of Test 9 (pathway—left hand) with driving indicates that those subjects with keener perception in the left arm have a moderate advantage in learning to drive? And, conversely, can it not be assumed that the relatively high negative partial regression coefficient of Test 8 (pathway—right hand) with driving indicates that those subjects with keener perception in the right arm show a preference for the use of the right hand which is purportedly a handicap in learning to drive a golf ball?

Results here are only indicative for it is not impossible that the relative behavior of these partial regression coefficients might be due to mathematical rather than psychological causes for, after all, they are determined by what makes mathematically the best prediction of the criterion on the principle of least squares and it is not impossible that this mathematical behavior might be indifferent to psychological justification. Further research, therefore, will be needed in order to either confirm or refute these tentative hypotheses.

INTERPRETATIONS OF THE FINDINGS

In any interpretation of the findings of the present study it must be remembered that the data herein presented pertain to the early acquisitional stages of learning the two perceptuo-motor skills and that kinesthesis represents that ability to perceive bodily movement and tension which is measured by the tests used. Then too, the population involved in the study represents a rather restricted group in the total population. With these limitations in mind, and in so far as the measures are reliable and the group of subjects representative of col-

lege freshman and sophomore male students, the following interpretations are made:

1. There is no justification for the use of the phrase "general kinesthetic sensitivity and control" unless reference is made to the sum total of many specific abilities, for the uniformly low correlation coefficients among the tests seem to indicate that kinesthesis is quite specific to the stimulus patterns involved in the tests.

2. Certain phases of kinesthesis show moderately low relationships with performance during the early acquisition of the two perceptuomotor skills but this relationship is sometimes negative.

3. The partial correlation coefficients are arithmetically larger in every instance between the kinesthetic test scores and putting than they are between the kinesthetic test scores and driving when the influences of such factors as chronological age, body build, intelligence, and grip strength are statistically ruled out.

4. Although the relative predictive value of a test is not necessarily dependent upon the pattern of movement involved, there are rather definite indications that the more closely a kinesthetic test simulates putting, the greater is the tendency for subjects standing high in that test to show better performance in putting. This is only approximately true with respect to driving, however.

5. No one kinesthetic test used in this study can be used to predict individual early performance of *all* individuals in either putting or driving although multiple correlation coefficients of .505 and .422 between a team of four of the tests and each of the two skills respectively indicate the possibility of somewhat reducing the error of chance prediction in classifying those individuals at either extreme of the distribution of scores on the battery of kinesthetic tests into probable successful and unsuccessful groups in learning to putt and drive a golf ball.

6. Of the four tests combined to make a team for prediction purposes, Test 8 (pathway—right hand) contributes relatively more in predicting success in early learning in putting and driving than any of the other tests. Test 10 (putter target) is the next highest contributing factor with respect to putting and Test 9 (pathway—left hand) with respect to driving.

CONCLUSIONS

This study has attempted to investigate the relationship between certain phases of kinesthesis and early performance in two perceptuomotor skills. It has not purported to investigate necessarily, only the phases which are involved in the two skills or to investigate all of the phases involved. The conclusions of the study, therefore, are definitely limited to those specific phases of kinesthesis which the five most reliable tests used in the study measure. They are:

1. Efficiency with respect to certain phases of kinesthesis shows a low but rather definitely *positive* relationship with success in performance during the early stages of acquiring the two perceptuo-motor skills involved in this study.

2. Efficiency with respect to certain other phases of kinesthesis shows essentially a *zero* relationship with success in performance during the early stages of acquiring the two perceptuo-motor skills.

3. Efficiency with respect to still other phases of kinesthesis shows a low but rather definitely *negative* relationship with success in performance during the early stages of acquiring the two perceptuo-motor skills.

4. The multiple correlation coefficients of .505 and .422 between a team of four of the kinesthetic tests and putting and driving respectively suggest the possibility that a battery consisting of more and better selected tests might be devised which would permit a rather accurate prediction of the possibilities of success or failure in the two skills of at least those individuals at the extremes of the distribution of performance on the battery of tests.

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An Analytical Study of Sex Differences as They Affect the Program of Physical Education

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MUCH has been written and more has been said concerning sex differences. Basic truths are often buried beneath huge quantities of unsubstantiated statements and half-truths. The physical educator who is building a program of physical education for both sexes must decide if and how these two programs should differ. He must base his decisions on facts, not fancies. He will have no trouble in finding printed material on the subject but this material is scattered in many publications and is full of conflicting opinions. Many of these opinions are based on prejudice rather than on scientific facts. All sex differences mentioned in these scattered articles may be listed under one of three categories.

1. Those that have, as yet, no scientific basis and which seem to be based on time-worn prejudices only.

2. Those which are actual differences but which have developed because of social, rather than biological, influences.

3. Those that are proven biological differences.

The last two items may be difficult to distinguish in many cases, but the reader should always keep in mind the fact that society does have a way of affecting even the physical characteristics of its members.

This paper is an attempt to simplify the work of the student of sex differences. Herein are summarized the findings of many research workers. The bibliography will guide the student to more detailed studies on the subject.

ANATOMICAL DIFFERENCES

General Growth.—The growing girl at any age is farther advanced toward maturity than is the boy. X-ray studies [73, 81, 40, 96*] of the bones of the hand and wrist show that these bones ossify sooner in the female than in the male. At any age from a few months to twelve or thirteen years this sex difference in ossification can be seen. For instance, at 9 or 10 years of age the pisiform bone of the girl is completely ossified, but not until the twelfth or thirteenth year does this take place in the

* Superior figures refer to numbered Bibliography at end of article.

boy. And, again, the union of the epiphyses of the metacarpal bones and the phalanges is generally completed at 16 years of age in the female hand but not until 19 years in the male hand. [73]

The general growth curve of the two sexes varies hardly at all until the ninth year. At this time the girl starts her prepubertal growth. This linear growth slows down and growth in breadth takes place shortly after the onset of the menstrual periods, between 12 and 14 years of age.[14] The result is a sharp break in the general growth curve of the girls at 15 years of age.

In comparing the growth curve of the boy and the girl these differences can be noted: (1) the boy's prepubertal growth starts two or three years after the girl's, (2) the boy's greatest acceleration in growth occurs in his fourteenth or fifteenth year, the girl's in the twelfth, (3) unlike the girl his growth is not suddenly slowed down as a result of sexual maturity but extends over a longer period of years, (4) the boy does not reach his ultimate size until the age of 20 or 21—three years after the girl reaches maturity.

Because of his more extended period of growth the boy has a greater proportionate growth in height, weight, breathing capacity, sitting height, and chest girth between the ages of 12 and 17 than has the girl.[6-164]*

Skeletal Framework.—The male is more rugged in appearance than the female for two reasons: (1) excessive amount of subcutaneous fat in the female [25] and (2) size and massiveness of the bones of the male. The adult male has the advantage in absolute length of bone. This difference is negligible in childhood, but the bones of the boy are wider than those of the girl of the same age.[81] The joints are larger except at 12 years (the year of the girls' most rapid growth).[25] In proportion to height, however, the knee joint width of the girl of 15 to 17 has the advantage over the boy. No such advantage shows in elbow width of the girl. Ellis [36-269] reports the results of a study that showed that the articular surfaces of the femur and humerus were relatively less in the female.

Height.—From birth the male child has a slight advantage in height which he maintains throughout the early growing period.[64-293] The difference is so slight, however, that it need be noticed only because it indicates a true distinction. Burk's [21] tables show that from the eleventh to fourteenth year the girl's acceleration of growth gives her a height advantage of as much as 2 inches. Some measurements show the girl becoming taller at 9 or 10 years.[64-192-193]

At 15 years the boy surpasses the girl again in height because of the differences in their acceleration of growth. Growing in height in

* In references separated by a dash, the first number corresponds to the source as given in the numbered Bibliography while the second number refers to the page or pages within the source.

the female ceases between the ages of 18 and 20 and in the male about 3 years later.[36-149, 70-293] The mean height of the adult male is from 5 to 6 inches more than that of the adult female.

Iowa Child Welfare Station Measurements[25] show that the girl's sitting height relative to her total height is the lowest at 11 years when it is 52.2 per cent and the boy's at 13 years when it is 51.4 per cent. The adult standards are 53.7 per cent for women and 53.0 per cent for men.

Weight.—There is very little difference in the absolute weight of the two sexes up to the period of prepubertal growth, the advantage though small always going to the male.[64-312, 25, 21] Sometime between the ages of 10 and 12 years the accelerated growth of the average girl makes her heavier than the average boy. This advantage may reach as much as 4 or 5 pounds at 12 or 13 years. At 15 years the boy again takes the lead which is never relinquished. Growth in weight is pretty well stopped in women at 18 years of age. At the State University of Iowa this weight is on the average 120 lbs.* Man's growth in weight continues well into the twenties, the average Iowa male student weighing 146 lbs.

More comparable figures concerning weight are the height-weight indices or the ponderal indices. This latter is found by dividing the height into the cube root of the weight. Ponderal indices of children measured by the Iowa Child Welfare Station show that the girl has a slightly lower ponderal index until the eleventh year. From this age until 19 she has a considerable advantage.

Fatty Deposits.—The relatively greater weight of the female can be explained to a great extent by her excessive accumulation of fat. Measurements at the Iowa Child Welfare Station show that as early as 4 years of age the girl has a larger amount of subcutaneous fat than has the boy. This difference increases until maturity is reached. The average adult female has about 7 more pounds of this subcutaneous fat than the average man.† In addition to this layer women also have an extra thick pad of fat over the hips and thighs.[36-160]

Center of Gravity.—Cotton[27] found that the mean center of gravity in man is located at a point 56.7 per cent of his height above the ground. Woman's relatively smaller upper trunk and her relatively heavier lower trunk and thighs are enough to overbalance her shorter legs. Her mean center of gravity is located at 56.1 per cent of her height. No studies of the location of the center of gravity in growing children could be found.

Shoulder Width.—Measurements taken by the Iowa Child Welfare Station show that from 11 to 15 years of age the girl has relatively

* These figures are from unpublished investigations completed under the direction of Dr. C. H. McCloy.

† Determined by the Du Bois Formula $H^{.725} \times W^{.425} \times 71.84$ equals surface area and average difference in the layer of fat.

wider shoulders than has the boy. Her greatest advantage comes during the thirteenth year when, relative to height, her shoulder width is 20.75, while the boy's is 20.40. After the fifteenth year the boy's becomes much wider until at 19 years of age it is 22.0 while the relative width of the female is 21.46. The relative shoulder width of the female is less variable than the male. From year to year there is a more gradual change. Weissenberg's [64-340] measurements of Russian Jews do not show as much sex difference in shoulder width as do those of American children.

Chest Measurements.—In absolute chest circumference the boy is superior at every age with the possible exception of ages 12 and 13. This superiority varies from 1 to 2 cm. at the different ages before puberty and increases to 11.4 cm. at 17 years.[25] Here is an indication that the upper trunk of the girl does not compare as favorably with that of the boy as does her lower trunk. Relative to height the chest girth is greater in the female up to 3 years of age, and at all other ages it is greater in the male. Measurements at the Iowa Child Welfare Station show that relative to height the chest girth in the male is the smallest in the twelfth year when it is .450. The measurements of the females varied more than did the males' measurements, her lowest being at 17 years of age when it was .441. At every age from the tenth year on the female chest girth was below that of the boy in his twelfth year. At 20 years of age the men and women measured were .476 and .444 respectively in relative chest girth.

According to Davenport [31] the thoracic index, found by dividing the chest depth into the chest width and multiplying by 100, reached its maximum at 11 years in girls and 12 years in boys. Davenport quotes Hoerch-Ernst as having found that the maximum is reached at 11 years and 14 years which more closely correspond to the precocity of the girl in other types of growth. After these ages there is a slight rise in the girl but a sudden rise in the boy. After the sixteenth year the boy's chest becomes quite broad.

Heart Size.—Roentgen-ray studies by Lincoln, Spillman, and Nicolson [57, 58, 59] show that the male heart in absolute size is greater except for the twelfth and thirteenth year. In relation to height the transverse width of the boy's heart is larger at every age up to the thirteenth year. No statistics could be found for the ages beyond 13 years except for mature men and women. Bainton's [4] X-ray studies found the average transverse diameter of the heart in men and women were 12.13 cm. and 10.67 cm. respectively. He found that when members of each sex are of the same height, weight, and age the transverse diameter of the heart of the male is 0.8 cm. greater than that of the female. Some such difference must be expected however for, as pointed out before, the man has a larger percentage of living tissue, muscular, etc., in his weight than does the woman with her greater amount of fatty tissue.

Abdomen.—While man seems to have a relatively larger thoracic region, woman, according to Ellis,[p. 185] has abdominal dominance. Manouvier and Cunningham [29] made measurements of a small number of cases before the turn of the century and came to this conclusion.

This relatively larger abdominal segment is filled with relatively larger visceral organs [77] and with the extra organs of generation of the female.

Pelvis.—The belief that the trunk of the male is more wedge-shaped than that of the female is based upon the assumption that his shoulders are relatively broader and his hips relatively narrower. It has been pointed out above that the male shoulders are relatively wider. The assumption concerning width of pelves, however, needs further investigation. Tables from Martin [64-1127] show that the female pelvis is relatively broader and more shallow than the male. These measurements were of the bony pelvis itself. Measurements of living persons by Weissenberg [64-352] show the absolute pelvic width of women to be 0.4 cm. wider than that of men at the ages 20–25. Such measurements as Weissenberg's ignore the fat pads over the hips. Such measurements are not a measurement of the skeletal pelves but the thickness of the fatty pads as well. Royce [80] and Marshall [63] found that this fatty tissue over the trochanter was 1.5 cm. thicker in women and over the crests of the ilia 0.5 cm. thicker.

From a study of measurements made recently at the Iowa Child Welfare Station came the surprising discovery that, starting at the age of 18, the relative width at the crests showed practically no sex difference. Their pelvic measurements showed the same growth curve as other parts of the body except that the female retained her advantage for a longer period. Probably this is caused by the fatty pads which start accumulating over the female hips at puberty. At 15 years of age her hips are relatively broader than at any other age.

In general shape of the pelves, Martin's tables indicate a greater spreading of the lower part of the pelvis in women. Caldwell and Moley [22] measured 70 skeletons and found that the greatest breadth of the sacroiliac notch was as much as 13 mm. more in the female.

In summarizing sex differences in the pelvis one must be cautious in generalizing on the subject too freely. Straus [86] states that the marked overlapping of pelvic characters of males and females makes it impossible to definitely sex an unknown pelvis. "There are," he writes, "no distinct sexual types. The 'type' is only an extreme form, expressed by the mean for any character and is in no sense the rule. . . . The 'typical' sexual differences are apparent only at the extreme ends of the range."

An unpublished X-ray study made by McCloy, of a small number of young women, shows clearly that individual pelves in the same sex may differ enormously.

Whether sex differences in pelves are innate or environmental has been a controversial problem. Thomson's [92] study of foetal pelves showed sex differences even before birth.

Lower Extremities.—Men's legs are relatively longer than are those of women. Weissenberg [64-410] found that leg length of men was 52 per cent of their height and that of women 51.2 per cent. All studies except Bach's [64] show this to be true. Studies of growth comparisons in leg length indicate that girls have the advantage from 7 years of age to the onset of puberty at 12 years.[8, 64-410, 99] The boy generally takes the lead in this measurement after he starts his great linear growth around 12 years. Growth in leg length stops in the girl at 16 years of age, but the leg of the boy is still growing at 18 years.

The lower leg is relatively much shorter in the female than the male.[64]

Bach [64] found the absolute calf girth of men and women to be quite comparable—33.6 cm. for men and 33.3 cm. for women. The thigh girth, on the other hand, is much greater in women. Due to the accumulation of fatty pads during the years of puberty the growing girl from 11 years of age on has at every age a relatively greater girth—at many ages an absolute advantage.

It is true that boys and men have relatively longer feet than do girls and women. At the age of 10 years the girls' feet are at their longest proportion, 15.6, and at 13 years the boys' feet are 16.1 per cent of their height. At 16 years the girls' relative foot length is 14.7 and the boys' 15.53. The ratios for adults are 15.5 for the male and 14.5 for the female.[30]

Upper Extremities.—As stated above, the leg length of growing girls exceeds that of boys absolutely and relatively during the ages of 7 to 12 years. However, the arm length of girls during these years never surpasses that of the boys,[64-386] showing again a sex difference of inferiority of upper body development in girls. At 13½ years the girl does have a relative advantage of 0.2 per cent, but this advantage is short-lived. Arm length increases in girls until the seventeenth year but is still increasing in boys in the eighteenth year according to Wallis.[99]

Hrdlicka's [45] measurements of thousands of humeri resulted in the following comparisons: (1) the upper arm is absolutely and relatively shorter in the female; (2) the humerus is smaller in diameter in the female; (3) the forearm of the female is relatively more shortened than is the upper arm; (4) the upper arm in the female is relatively shorter than is the thigh when compared to the male.

Bach [64-392] found that in men and women of the same height the upper arm of the man is longer by 0.4 to 0.5 per cent of the body height. Comparisons of forearm and upper arm girths made by the Iowa Child Welfare Station show the same tendency as do other

studies.[85] The thicker layer of subcutaneous fat, however, especially in the upper arm must be considered.

Potter [72] found that the angle of obliquity of the forearm with the upper arm is 173.17 degrees in men and 167.35 degrees in women, thus showing that the extended arm is 5.84 degrees nearer to being straight in the adult male.

PHYSIOLOGICAL DIFFERENCES

Basal Metabolism.—At every age the male has the higher metabolic rate.[9, 10, 70, 89] In comparing the data of Talbot [89] with those of Benedict and Hendry [10] an advantage in the male of more than 10 per cent is found at every age up to 15 years. During this first 15 years of growth the basal metabolism is more nearly the same at 11 and 12 years of age and the widest apart at the ages of 4 and 15. At 15 years there is a difference of almost 21 per cent. Benedict and Emmes [9] found in comparing adults that the male had an advantage of 5 or 6 per cent. They admit that the relative larger amount of subcutaneous fat in the woman will tend to make her rate lower because of less protoplasmic tissue to generate the heat and because of better insulation, but they do not believe that this factor entirely accounts for the sex difference in metabolic rate.

Riddle [76] believes that this difference in the metabolic rate is the deciding factor in the differentiation of the sexes. He found that the sex of animals could be reversed by changing the metabolic rate while the organism is in the egg stage. The rate decided the sex. This being so, Riddle believes that a change of metabolic rate in adults or growing children will alter the established sex differences. He lists activities, occupation, excitement, nutrition, and habits as methods of changing the rate.

Metabolism is somewhat more variable in women because of their periodic sexual cycle.[33]

Respiration.—Relative to height the female has a smaller breathing capacity than has the male.[36-105, 6-160] Kelley [51] found that using the ratio of the cube of the height with the breathing capacity gave the best device for comparing the sexes. Kelley found that during the twelfth to fifteenth years when the girl has superiority in other physical respects she still lags behind the boy in breathing capacity. This smaller capacity is partly but not entirely accounted for by the fact that the lower rate of metabolism in the female calls for less oxygen. But women have more respirations per minute than men [36-50] which proves that the lower female metabolic rate doesn't entirely balance the smaller lung capacity.

Cotton [28] found that the breathing of women is of the thoracic type and that of men is of the abdominal type. Restrictive clothing or athletic participation did not influence permanently the type of breathing.

Calcium Metabolism.—The calcium metabolic rate is more rapid in the growing girl than it is in the boy as indicated by the earlier ossification of the bones [81] and by her comparative freedom from rickets and tetany.[5]

The larger bones of the male show that there is a greater retention of calcium in the male during growth.[36-43] The amount of calcium in the blood of adult females is about 6/7 of that in the male and this amount is quite unstable.[62] According to Matters [65] there is a premenstrual rise in the amount of blood calcium followed by a fall just prior to the start of the period.

In summary, the male rate of calcium metabolism seems to be more slow and sure.

Characteristics of the Blood.—Man has more red corpuscles per cubic millimeter than has woman. The usual comparison of 5 million to 4½ million is proven by Boerner's study.[15] Also the blood of man has about an 8 per cent advantage in hemoglobin content.[36-63, 47, 15] The specific gravity of the male blood is higher, 1.057 in man to 1.054 in woman, according to Jones.[50] The average variation of specific gravity is also greater in man, .0033 to .0027.[84] Ellis [p. 68] points out that a good physique is associated with a high specific gravity of blood in any given individual. He advances the theory that the lower specific gravity of the female blood may be a contributing factor to the relatively small degree of athletic ability in the woman.

These three sex differences in blood—fewer red corpuscles, less hemoglobin, and lower specific gravity — seem to be correlates of the lower metabolic rate in women.

Pulse.—Vertical pulse rate comparisons tabulated by Lincoln [57] show only a slight sex difference in ages 2 to 12 years, but in a horizontal position the girls' pulses were consistently faster. Faber and James [38] found similar results. The age of 16 years had a sex difference of 6 beats per minute in favor of the girl. Campbell [23] states that a difference of 18 beats is the average in adults. The best explanation seems to be that since the female heart is relatively smaller and the blood of the female has less red corpuscles, the increased pulse rate is a compensation for these weaknesses.

Electrocardiograms of children show a higher *P* wave in girls from 7 to 11 years and higher *Q*, *R*, *S*, and *T* waves in boys at practically all ages up to 13 years—the oldest age studied.[58]

Blood Pressure.—Lincoln [57] found little sex differences in blood pressure up to 13 years. Faber and James [38] insisted that any sex differences up to 15 years were insignificant. Richey [75] however found that the curve formed by the average systolic pressures at each age differed widely after the age of 8 years. From 10 to 14 years the girl has the higher systolic pressure, at 12 years having the maximum advantage of 4.16 mm. The diastolic pressure also increased from 10

to 16 years. His suggestion that the sedentary life of the girls might tend to make the diastolic pressure higher should be of interest to physical educators.

In adults the systolic blood pressure has been found to be higher in the male.[103, 36-70, 88] Averages stated by various studies showed differences ranging from 5 to 10 mm. Richey found that at the age of 18 years there was a comparison of 113 and 101 mm. in systolic pressure and 69 and 66 mm. in diastolic pressure, both showing male superiority.

Pulse Ratio as an Indication of Physical Fitness.—The pulse ratio, determined by a modified version of the Hambly cardiovascular test, is a comparison of the pulse ratio before and after a definitely prescribed exercise. In the few studies made of this test [17, 94, 95, 102] the males have made the lowest ratios. Boulware [17] compared her study with that of Tuttle and Skein [95] and found that the female heart rate increases more rapidly with exercise and requires a longer time to return to normal. This sex difference can be accounted for by (1) the relatively smaller heart in the female, (2) the smaller number of red corpuscles and less hemoglobin, (3) the relatively shorter legs of women and girls resulting in a relatively greater amount of work in performing the prescribed exercise, and (4) poorer physical endurance in general.

Muscular Strength.—Mosher and Martin [69] conclude that the sex differences in strength "are due to differences in the use of the muscles brought about by conventional limitations of activities or by dress." Baldwin's [6] study tends to prove this. In comparing the strength of the left and right arm and upper back (muscles which are used much more by boys than girls) through the ages of 7 to 17 years, he found the girls' was inferior at all ages, the closest approximation of strength being at 10 or 11 years. The greatest increment of strength was between the twelfth and thirteenth year for girls and between the fifteenth and sixteenth year for boys. After 15 years of age the strength of the girls increased very little, whereas the period between 14 and 18 years was one of great increase in boys' strength.

Sargent [36-282] found that the muscles of the legs were relatively the strongest muscles in the woman, thus substantiating the opinion of Mosher and Martin.

Wendler's [106] study is a more complete study of the strength of isolated muscle groups. Those muscles which were markedly stronger in the male relative to total strength were the hand flexors, hand extensors, arm extensors, latissimus dorsi, foot flexors, and trunk posteror. The strongest muscles in the female were the pectorals, shoulder retractor, foot extensor, leg flexor, leg extensor, thigh flexor, thigh extensor, leg abductor, and leg adductor.

Speed of Muscle Contraction.—Simple reaction time is quicker in boys at every age from 6 to 17 years,[36-276] this difference being greatly

diminished when the element of choice is involved in the stimuli. Book[18] states it this way: "boys are superior to girls in rapidity of movements under conditions in which the direction of attention is fixed and the girls are superior in rapidity of movements (when) . . . the direction of attention is constantly shifting." In athletic events calling for great speed of contraction and relaxation such as running, broad jumping, high jumping, the records are much better for the male. Other factors such as body build must be considered however in such activities. McCloy's T-scores for the Sargent jump show a definite superiority in the male.

Irritability as shown by the knee jerk is 42 per cent greater in women.[105]

Dexterity.—Husband and Ludden [46] conclude from their 5 tapping tests that there is no innate sex difference in dexterity. An individual, regardless of sex, is superior in performing the type of activity which he has practiced in the past. Women are better in threading a needle and in dancing because they have practiced these types of activities. Women taxicab drivers are responsible for 3 times as many accidents per thousand miles as are men drivers [98] because in all probability all early training of men has more to do with the dexterity required in driving a car.

Bryan [36-278] found a slight superiority of boys over girls in a tapping test involving 8 separate joints except for the ages 10 to 14. He found a retardation in tapping ability in girls between 13 and 14 years and in boys between 14 and 15, indicating a nervous fatigue caused by functional changes during puberty. This is more pronounced in girls than in boys.

Burpee test scores which indicate dexterity in the control of the large muscles show that the mean scores of the boys are steadily increasing through elementary grades and junior and senior high school, but the scores of girls are decreasing slightly.

Motor Educability.—The Iowa Revision of the Brace Test was used in Des Moines to measure the pupils' ability to learn new skills. Ages 9 to 19 years were included in the test. From these scores can be noted that (1) the girls are more precocious in reaching their ultimate adult level (about 13 or 14 years of age) and (2) the girls are superior in motor educability up to 14 years of age, the boys increasingly superior from this age on. At age 19 the boys' scores are still increasing.

Johnson [49] in teaching the skill of tight rope walking to college men and women, found that the rate of improvement was much slower in the women. He observed that fear materially hindered the learning of women but was a small factor in men. Society encourages fear on the part of the girl and fearlessness in the boy.

Glandular Activity.—It is not known exactly what causes masculine and feminine traits, but it is believed by Ellis [p. 43] that one or the other

is dominant because of a certain balance between the glands. This balance may cause a range from feminine to masculine traits in both men and women. "Man and woman are not purely masculine and feminine but a variable mixture of both" according to Chenoweth.[26]

The thyroid, pituitary, adrenals, and gonads are the principle glands affecting these traits.

The thyroid plays a more important role in women than in men.[86-97] Its size is more closely related with height, weight, rate of growth, grip strength, and heart pressure in girls than in boys. At puberty there is a rapid growth in the girl's thyroid. Exophthalmic goitre and other diseases of the thyroid are more prevalent among women than men.[43, 86-100] The thyroid is the regulator of metabolism and is therefore back of one of the major sex differences.

The pituitary gland is larger in the female,[77] but hormone from the male pituitary is almost twice as potent.[37] The anterior pituitary is the seat of the masculine traits and the posterior pituitary the basis of maternal "instincts." [55, 76]

The gonads have as one important function the regulation of growth.[79] An observation of eunuchs in Russia [60] shows that the gonads act during puberty to inhibit growth in the long bones and to stimulate growth in width of bones. Since linear growth ceases in girls before it does in boys this indicates that the gland regulators must differ in activity in each sex.

Periodicity of Women.—Tuttle and Frey [94] found that the physical efficiency of women, as shown by the pulse-ratio test, is the highest in the period of endometrium growth and during the menstrual flow and lowest during the regeneration period with a rise during the period of rest. Scott and Tuttle [82] found no significant fluctuation in pulse rate occurring because of menstruation. Allen [1] states that blood pressure lowers during the period, but this is not true with all women, especially after the first or second day, as shown by studies quoted by Ellis.[p. 121] Painful menstruation is generally caused by poor muscle tone and, according to Sturgis,[87] "often all that is needed during a period is a little more exercise rather than a little less." She believes that each case of dysmenorrhea should be diagnosed and exercises prescribed to suit each individual. Hamer [42] found a direct relationship between the strength of the abdominal muscles and dysmenorrhea in the women she examined. Duntzer and Hellendall [34] found that a majority of the 1500 women who were participants in a gymnastic meet continued their exercises during menstruation, the quality of the gym work of 61 per cent of these women being either the same or better than usual during this time. As to those who reported painful results coming from exercise at this time the majority attributed this to overexertion or outdoor exercise during hot or cold weather.

PSYCHOLOGICAL DIFFERENCES

Interests.—O'Shea [71] concludes that there are 5 sex differences in play interests: (1) Girls at 5 or 6 years of age enjoy painting and crayon work more than do boys of this age. More girls draw flowers while boys draw ships and engines.* (2) Joy in vigorous play wanes in girls at middle childhood but waxes in boys.† (3) Girls, especially during adolescence, retain an interest in a wide variety of games as contrasted with the tendency of boys to specialize in a few sports. His desire to become a member of future athletic teams may account for the boy's specialization. (4) Girls have a stronger and longer interest in dolls. Boys lose their interest in toy animals and people after 6 or 7 years of age—tin soldiers excepted. The channels of imaginative play differ. (5) Boys engage in tramping, fishing, and hunting activities more frequently.

All through these differences in interests can be seen the guiding hand of society.

Lapp's study [52] indicates that the major sex difference in interests in a physical education program is that boys are more interested in the resulting physical development such as stronger heart, lungs, and muscles, while girls have less interest in the intensive activity necessary for rapid physical development and desire instead activities which result in gracefulness or which will provide an opportunity for having fun.

Carney's study of 42 girl gangs [24] shows that adolescent girls when free from the restraints of elders have somewhat the same attitudes and interests as do boys at this age.

A comparison of the studies of Rath [74] and Anderson,[3] reveals that the 10 most liked and 10 most disliked activities of boys and girls are quite similar. Activities such as tennis, swimming, basketball, canoeing, baseball, and skating rank high in both sexes and formal activities such as marching and calisthenics and some types of dancing such as folk dancing for girls and gymnastic dancing for boys ranked low.

Emotions.—Women are more emotional than are men.[93-348, 83] There is a greater prevalence of nervous disorders, such as hysteria, among women.[18, 53] Women have greater disturbances of the thyroid, the gland of emotionality.[18, 36-101]

A part of the explanation of woman's greater affectability is based on sex differences in physical make-up and in physiological functions.

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* Lehman and Witty[54] found a greater aesthetic appreciation on the part of girls of all ages.

† The sex differences in physique during adolescence might give a partial explanation, but Driftmier[32] thinks that the physical traits of high school girls had little to do with their interests. Since society has loosened its restraints on girls and women, girls are choosing more and more to participate in such vigorous sports as tumbling, basketball, hockey, lacrosse, and baseball.[35]

Ellis mentions a number of items that contribute to an innate difference in emotions. Among the contributing factors he lists (1) her larger thyroid gland, (2) her inferior mental and physical energy, (3) the smaller amount of red corpuscles in her blood, (4) the instability of her calcium metabolism, and (5) the larger extent of her sexual sphere resulting in more introvertive behavior,[52] and inconstant physiological balance. Those who believe in the James-Lange theory of emotions, can say that the relatively larger visceral segment of women receives a relatively larger amount of impulses from the sympathetic system, and the greater response will cause emotions to be more intensely felt in women than in men.[100]

The effect of environment on emotions must also be considered. From birth the natural emotionality of the girl is intensified by the conventions of society. The play activity of the girl is restricted in area and in type. She is forced to be an introvert type because of restraints preventing her from enjoying the extrovert type of behavior. According to Allport [2-345] "she must react to people rather than things." She is allowed and thus encouraged to weep when injured, while the boy is urged "to be a man" and not to cry "like a girl." She learns early that the world, including her parents, prefers boy babies. She is confronted at all times with a man-made double standard of morals.[2-345] She is faced with the necessity of preparing herself for both a domestic and a competitive occupation. Conflicts in desires arise. As a result of these environmental factors the existing emotionality in the girl is greatly increased. It is this acquired emotionality which physical education must condition. Granted that there is an innate basis for a sex difference in emotionality, the environmental influences increase this trait in women to an undesired height of emotional instability. Ellis (p. 364) sees the possibility of reducing affectability in women to "finer and more delicates shades" in physical education classes, thus approaching the more steady male standard of emotions.

APPLICATION TO PHYSICAL EDUCATION

In constructing a program of physical education for each of the sexes, two general factors must be considered—first, existing differences, whether innate or acquired, and second, the differing needs of boys and girls to fit them for their peculiar place in the modern social plan. An attempt has been made in the previous discussions of sex differences to point out that this or that difference may be inherent or the result of different environments or a combination of both. It is not within the province of this paper to ferret out the exact basis for each difference. Evidence is sadly lacking and for the most part unobtainable. At best, the physical educator can only weigh the scanty available evidence and draw his own conclusions. It would seem, however, that when such a relatively stable sex difference as height is affected by environment,

according to such persons as Ellis (p. 148), Mosher,[68] and McKenzie,[65-276] many other sex differences must also be partly attributed to environmental differences.

Physical educators must not only consider existing sex differences but must realize that through physical activities some of these differences may be enhanced or minimized. If a certain sex difference were socially undesirable it might be well to attempt to eliminate that difference by providing a program which stimulates this or that physical or mental factor or which does not do so.

The physical education activities are tools by which we may fashion the physique and personalities of future individuals. The question is: What are the considerations which must be made for the differences in the two sexes?

Effect of Differences in Rate of Growth.—One of the most outstanding differences is the greater precocity of the girl's growth, indicating that she is physically older than the boy at every age. Baldwin (p. 196) states that this more mature physique is accompanied by advanced mentality, attitudes, interests, and emotions, and he suggests that the physical training program for girls from 7 to 18 years of age should differ from that of boys. McKenzie (p. 273), on the other hand, sees no reason why boys and girls should be given a different type of program until after the ninth year. The increased growth of the girl after this age calls for the separation of the sexes after the fourth grade with a change of program to fit the different type of growth, attitudes, and interests which accompany puberty.

Effect of Differences of Body Build on Type of Physical Activity.—The general body build of girls requires a special type of program which recognizes the relatively underdeveloped upper portion of her body. Examples of this underdevelopment are many. There is less sex difference in the width of the knee than in the width of the elbow. The girl's shoulder width is relatively narrower. Her chest measurements are relatively inferior. Her lung capacity is smaller. Her center of gravity is lower. The upper extremities compare more unfavorably with boys' than do the lower extremities. Thoma[91] quotes Mathies as saying that this inferiority is a natural difference. On the other hand, Buche-Geis[19] believes that the sedentary, conventional behavior into which the girl falls during and after puberty because of the dictates of society is responsible for much of her inferior thoracic development. Therefore she advocates strong and vigorous activities such as running, swimming, and apparatus work to foster the natural broadening effect of the ovarian secretions at puberty.

Most authors[41, 104, 66-276] suggest the use of running and swimming for developing the chest muscles, but there is a controversy concerning the use of apparatus by girls. It must be remembered that girls are not

physically as well equipped to perform vaulting and hanging stunts on pieces of apparatus as are boys, but there is a drastic need for the development of the muscles used in such stunts. It is the belief of Lowman[61] that weakened muscles, such as the rhomboids and other fixators of the scapulae, when accompanied by heavy breasts, are the cause of poor posture, the resulting round back cramping the thoracic organs. The underdevelopment of chest muscles would seem to make for less endurance and a tendency to overfatigue. Overfatigue combined with the presence of disease germs is one of the contributing factors in making the body susceptible to the ravages of disease. Although proof is lacking one might feel that there is a parallel between the weakness of the female thoracic muscles and the greater susceptibility to tuberculosis of the adolescent girl[7] and the fact that more women contract tuberculosis and bronchitis than do men.[18] Mosher and Martin[69] make the assertion that the lack of muscle power in such muscles as the pectoralis may be "a distinct racial disability." Apparatus work may well be taught to girls keeping their peculiar body build in mind. There should be no attempt to follow strictly the stunt routine prescribed for boys. Running games and all games which require the use of shoulder girdle, such as volleyball, baseball, and basketball, serve to develop the upper body. It must always be remembered that the relatively small heart and lungs of the girl handicap her endurance.

Effect of the Special Biological Function of Women.—A third major difference to be considered is that the special biological function of women should call for activities which will in no way impair this function but which will assist in its natural development. The delicacy of the female sexual apparatus has been exaggerated by many writers. McCloy[67] has dispelled one false belief concerning the detrimental effect of the broad jump on the position of the uterus. One writer[106] says, "I do not know of any exercise which is good for the general health which will have any harmful effect on these (generative) organs. . . . (They) are exceedingly well protected by the bony frame-work of the pelvis against external violence (much more so than in the male), and they are less likely to be affected by overfatigue or chill than the skeletal muscles, the lungs, the heart, and the organs of digestion." McKenzie (p. 282) reported a study in which the majority of physicians believed that moderate athletic exercise favored easier labor and a shorter convalescence at childbirth, and most gynecologists believed that violent exercise would not produce pelvis displacements.

Much of the controversy hinges on the effect of exercise at various ages on the shape of the pelvic girdle itself. In Thoma's[91] translation of Mathies is found the opinion of many that "excessive sports activities during . . . . (adolescence) has the tendency to develop a narrow high pelvis, characteristic of the record-breaking girl." Duntzer and Hellendall[34] admit that the majority of women athletes in their investigation

had comparatively small pelves but "that this is not the result of the bodily exercise but is rather due to the fact that women who are interested in athletics are usually not of the type that have a large pelvis." Their investigation showed also that despite these narrow pelves, all of those women athletes who had borne children had experienced no trouble during these births because of this narrowness.

Vaughan[96] attributes difficult births not to active work and play but to the sedentary habits of civilization. She states that it is before and at puberty, from 11 to 15 years, when there is rapid growth in the pelvic girdle, that the greatest harm comes because of long continued sitting and indoor life. The result is an unnatural kidney-shaped pelvis which we have considered natural. This idea, in direct opposition to Mathies, advocates the free use of activities which make use of the sacro-iliac joints, these joints being practically never used in modern civilization except in physical education activities. Buche-Geis[19] recommends all vigorous exercises, especially apparatus work involving energetic swinging and straddling of the legs and raising and lowering the front of the pelvis, track and field events involving bending, such as the high jump, and games calling for bending or squatting. These activities should offset the detrimental effects of civilization and aid in the proper development of the pelvic girdle as well as serve to develop the abdominal muscles.

According to Ellis (p. 286), "there is no group of muscles which it is more desirable for a woman to possess in a developed condition than those of the abdomen." As has been pointed out before, muscle tonus in this region is important in maintaining a normal blood supply at all times, tending to relieve the painfulness of congestion which occurs at menstruation.

Effect of Existing Differences in Interests.—The last consideration of sex differences which will be made here is that concerning interests and how they affect the type of physical activity. It is fairly well established that girls enjoy rhythmic activities more than do boys. This may be partly due to the fact that dancing is considered effeminate by much of society, but according to Ellis (p. 360) dancing is loved by women because of the opportunity it gives them to express their excessive emotions in a legitimate manner. As a pleasing type of activity, rhythmics should therefore have a greater emphasis in the girls' program. The boy needs some of this training also but not to the same degree as the girl.

The boys' program will have a larger share of personal combat activities such as boxing and wrestling which develop masculine aggressiveness, a trait undesirable in girls according to the present viewpoint of society. Such rough activities as boxing, wrestling, and football are also barred from the girls' program because of the greater chance of injury in girls through physical contacts.

In the time provided in the program for competitive games such as

basketball, hockey, soccer, tennis, etc., there seems to be no reason for a difference in the classes of the two sexes. The growing interest of the girls in sports, which is resulting because of the lifting of social restraints, indicates that the urge to compete is an innate urge with no sex differentiation. This opportunity for developing desirable social and moral characteristics which will aid both the man and the woman of the future should not be given to one sex any more than the other. Modern inventions in household appliances and improvements in medical science have released women from the necessity of spending a lifetime in tending strictly to household duties and to bearing children. More and more they are entering the social, political, and economic life of the world. Sportsmanship, teamwork, leadership, emotional control are as important in the training of girls as they are with boys. Competitive sports contribute a means to this end. Whether these competitive athletics for girls should be interscholastic in nature must be answered by the women who administer girls' physical education. If it is impossible to eliminate the emphasis on winning and all the attendant evils the decision should be a decidedly negative one.

Most sports of today fit the special aptitudes of boys and therefore even though girls do have ability and interest in these games they should make no attempt to compete with boys at the male level of competition.[90] Such an attempt would annul many of the benefits which come from competition. Detrimental exhaustion and warped attitudes toward the opposite sex would result. Competition among girls at their own level, with girls of similar ability under a suitable supervisor, preferably a woman, should result in no more unsportsmanlike conduct, emotional outbursts, or physical collapse than would be found in a game among boys. Burdick[20] gives a good rule to follow: "Girls' activities must not be too ladylike, neither should they be too strenuous." Most competitive sports become too strenuous for a girl if she seriously attempts to defeat a boy. This paragraph should not be interpreted to mean that coeducational classes in physical education should not be held nor that the two sexes should never join in play participation. Games such as volleyball, tennis, or badminton provide an excellent opportunity to teach socially desirable attitudes between the sexes. In such contests each competing team is made up of a mixed group whose main objective is companionship. There is no question of one sex attempting to show its superiority to the opposite sex.

Conclusion.—The temptation to accept the ideas of the past without regard as to whether these ideas have a scientific basis acts as a hindrance to progress in any field of endeavor. The precepts of physical education must be based on facts—not guesswork. The interpretation of these facts may vary, but these variances are not so wide as they would be if facts were lacking. The main purpose of this paper is to present the known facts concerning sex differences. Whether these dif-

ferences are great or small, and whether they require further proof can be determined from these pages. Whether these differences are desirable or not, whether they are natural or acquired and how they may be utilized in constructing a physical education program must be answered by society in general and the reader in particular.

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PIONEER WOMEN
in
PHYSICAL EDUCATION

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FOREWORD

WHILE we realize that there were many other women who did valuable pioneer work in our field, it was decided to initiate this project with the biographies of only those early pioneers whose names and activities are best known. At the same time, in recognition of all of those whose deeds and contributions are here unsung, we wish to dedicate this little publication with affection to *all* of the pioneer women in physical education.

We were fortunate enough to be able to persuade some of these "pioneers" to give us autobiographies; other material was contributed by friends to whom we are greatly indebted and to whom we extend our deep-felt gratitude. No attempt was made to edit this or to change the style, as it was felt that the individual treatment in each case made it more personal and more appealing.

It is most interesting to note the varied interests and approaches which drew these pioneers into what, at that time, was not a profession. As we read we are more and more impressed with the fact that we are indeed delving into rich and valuable history and we realize more and more what a debt not only we, but the whole field of physical education, owe to these magnificent women.

We apologize for any errors or omissions.

AGNES R. WAYMAN
Barnard College, Chairman of the
Committee on Publications—1940–'41

Life and Work of Amy Morris Homans

Pioneer and Leader in the Field of Hygiene and Physical Education

THE YOUTH YEARS

BORN at Vassalboro, Maine, on November 15, 1848, and reared in a home atmosphere of culture, high standards of behavior and traditions of gracious living, all exemplified by her high minded, beautiful mother, Miss Homans early showed indications of a sturdy character, an independent, clear thinking mind and a quiet, reserved manner. The development of these and other qualities and traits was wisely guided into right directions by her parents. Her formal education was received at Vassalboro Academy, probably a fine school, still a successful "going concern," and Oakgrove Seminary, Maine. This schooling was supplemented by private instruction in history, literature, and languages. In the latter institution Miss Homans served as preceptress two years (1867-1869), whether as student assistant or a graduate is not clear.

TEACHING CAREER

With this educational preparation and teaching experience Miss Homans entered upon a teaching career of eight years, serving as teacher or principal, or both, in three schools at Wilmington, North Carolina. The sources of information are somewhat at variance as regards two of these schools, the "Hemenway" and the "Tileston." It is probable that the former was reorganized and either became the "Tileston" or was merged with it when Mrs. Hemenway had given it a fine new building in memory of her father, Thomas Tileston. Later it became the Tileston Normal School. Miss Homans served as principal and teacher in the Hemenway School and as teacher in the Tileston Normal School, later as teacher and principal in the McRae and Chadbourn School, also at Wilmington, North Carolina.

Those eight years of teaching in and directing schools gave Miss Homans valuable practical experience in dealing with children and youth, opportunity for developing her native abilities in teaching and managing, and scope for her maturing powers of judgment and understanding of people. They served as a providential preparation for her future career. It was while teaching in the Hemenway and Tileston schools that she met and became acquainted with Mrs. Mary Hemenway. That was probably the most significant incident in Miss Homans' life, up to that time, for it eventually changed the direction of her career.

"Mrs. Hemenway was widely known as one of the wealthiest women

in Boston, and as a wise and generous dispenser of her riches for the promotion of worthy objects at home or elsewhere," according to Dr. F. E. Leonard, in his *History of Physical Education*. She once told Miss Homans that, as she had not been called upon to make a contribution and possible sacrifice to the Union cause in the War between the States, because her husband was an invalid and her son was too young, she felt that it was her duty to do what she could for her country. Among other benefactions, she used her wealth and devoted her energies to ameliorate the conditions of the impoverished south, resulting from the war. She became especially interested in furthering projects of an educational and patriotic nature and may have had in mind starting some such undertakings about the time she met Miss Homans.

On her visits to the schools in Wilmington, North Carolina, which she had helped to support or establish, Mrs. Hemenway had opportunity to observe Miss Homans' work and to get acquainted with her. She undoubtedly recognized her fine qualities and superior abilities, already demonstrated or latent. If Miss Homans at that age (early or middle twenties) had even half the power of impressing people that she had in later years, it is safe to assume that Mrs. Hemenway was duly impressed. Subsequent events amply justify that assumption, for, in 1877, she engaged Miss Homans as her executive secretary. As such she would, and did, have an important part in Mrs. Hemenway's philanthropic, educational, and patriotic enterprises, opportunity and scope for her native abilities of organization and management, to some extent trained and tested in her school work. In this association, Mrs. Hemenway and Miss Homans soon became dear friends. This friendship ripened through the years and endured to the end of Mrs. Hemenway's life. To Miss Homans it was one of her most cherished memories.

COLLABORATION WITH MRS. HEMENWAY

The next period of Miss Homans' career, in which she worked in association with Mrs. Hemenway, began in 1877 and might be said to have ended when Mrs. Hemenway died in 1894. By a provision in her will the work Miss Homans then directed was to be carried on and supported for fifteen years. With this "posthumous association" the period of collaboration with Mrs. Hemenway lasted thirty-two years.

Among the philanthropic enterprises engaged in during the first eleven years, jointly planned, financed by Mrs. Hemenway, and carried out by Miss Homans, three or four occurred toward the end of this period in Boston. This being the "home ground," they received more publicity than enterprises located elsewhere. They illustrate the kind of activities engaged in by the "partners." Moreover, they led by gradual steps to the founding of the Boston Normal School of Gymnastics.

The Old South Church, a well known historic Boston landmark, was about to be razed for financial reasons. But by Mrs. Hemenway's intervention it was permanently saved. Next the Old South Patriotic Prize

Essays and later the Old South Lecture series were established. These were typical expressions of Mrs. Hemenway's patriotic zeal, no doubt shared by Miss Homans, who organized and directed them until they were taken over by private organizations.

About this time the "partners" had begun to consider and discuss the important relation of home management to the health and vigor of the nation. As responsibility for this obviously rested on women, especially mothers of families, they felt that instruction in this subject should be given in the public school, something entirely lacking up to this time. As a first step in meeting this need, they introduced systematic instruction in sewing, and soon afterward, school kitchens for girls. While these new school features, soon taken over by the city, were valuable contributions to the public welfare, the two friends realized that their wholesome influence would be felt only in a limited area, partly because of lack of competent teachers. To widen the scope of such influence, teachers trained and skilled in household arts were needed. This need was met by a new school, the Boston Normal School of Household Arts, organized by Miss Homans and directed by her for two years. It was then taken over by the State and became the Department of Domestic Science of the Framingham State Normal School.

Having brought these projects to a satisfactory conclusion, Mrs. Hemenway and Miss Homans cast about for something of still broader scope. They were aware of the relatively new and growing "physical training" movement, recognized the need and potential values of such training, and saw in it far-reaching possibilities if it could be introduced into the schools and made an integral part of the curriculum. The probable favorable effects such training would have on girls especially interested them. They reasoned that strong, healthy mothers would be likely to produce healthy, vigorous children and thereby contribute to a higher level of the nation's physical fitness.

Having obtained such information about physical training as was available (we do not know how or by whom), and having decided to make its introduction into the Boston Public Schools their next project, Mrs. Hemenway and Miss Homans began to plan their campaign. They faced many and varied problems: what kind of work should be offered, how it should be carried on, how to get teachers who could handle it, and how to interest and persuade the school authorities to give their assent.

As regards the kind and character of the work, some friend had called their attention to Swedish gymnastics and convinced them it would be the most effective form of activity, best suited to be carried on in the school room. That would be the only feasible way at the time. Through this friend (or someone else) they learned of, and found, a young Swedish ex-army officer who was trying to get a start in the field of remedial gymnastics. He was Baron Nils Posse, a scion of one of the oldest noble families in Sweden, and a graduate of the Royal

Gymnastic Central Institute in Stockholm. Mrs. Hemenway and Miss Homans engaged him to give a "demonstration" of the Swedish system of gymnastics in the form of a series of lessons offered, without cost to the city, to groups of primary and grammar school teachers whose participation was entirely voluntary. More than a hundred teachers and thirty-two masters and submasters availed themselves of this instruction and became greatly interested. Somewhat later a more thorough course, also without cost to the city, to extend over two years was offered to twenty-eight selected teachers. This offer was accepted by the Hygiene Committee and the Board of Supervisors. The course, as well as the demonstration lessons, was begun during the 1888-1889 school year, at first in a room on Boylston Place, later at No. 2A Park Street.

In the meanwhile Miss Homans had been laboring with the school authorities urging the introduction of physical training in the schools. As a result of her efforts and the favorable reaction to the "demonstration" lessons, as well as the special course being given the group of twenty-eight teachers, gymnastics was introduced in 1890 in the primary and grammar schools, taught (about seventeen minutes daily) by teachers who had received a modicum of a year's training. In 1891 Dr. Edward M. Hartwell was appointed Director and Mr. Hartwig Nissen, Assistant Director of Physical Training.

While the campaign for introduction of physical training in the schools was carried on, Mrs. Hemenway and Miss Homans had made plans and preparations for a teacher-training school, and, in the fall of 1889, the Boston Normal School of Gymnastics was announced. It offered a two-year course to prospective teachers of physical training. With Mr. Posse as the only teacher and with a small entering class the School began its first year's work in the Park Street quarters. Concurrently, the training of the twenty-eight selected teachers was continued.

In January 1890, Mr. Posse resigned and was succeeded by Dr. Claes J. Enebuske. He had received his Ph.D. from the University of Lund, Sweden, and while a student there had also taken a course in Swedish pedagogical and remedial gymnastics approved by the Gymnastic Central Institute and given by one of its graduates. Miss Homans had secured his release from a well known private school in Brooklyn, New York, where he had been teaching gymnastics to boys. Dr. Enebuske continued Mr. Posse's courses comprising a daily gymnastics lesson, a daily "review" of the gymnastic material used, with instruction in methods of teaching and preliminary practice, students teaching each other in small groups. A course in Applied Anatomy and Physiology was also given.

While the new School was getting under way in the fall of 1889, Mrs. Hemenway and Miss Homans were planning the promotion of a notable event, the great "Conference in the Interest of Physical Training" in November of that year. Its convocation and proceedings were

brought about by their initiative, and its success was due in a large measure to Miss Homans' masterly organization and management. The first meeting of any magnitude of people interested in physical training, it was the most significant and important event, so far, in that growing movement; it had profound and far-reaching effects on the movement, giving it impetus and focussing on it the attention of educators and the public.

A committee of sixty-one distinguished men and women issued the call. The Conference, attended by 2000 people during the two days, was opened and presided over by Dr. William T. Harris, U. S. Commissioner of Education. The list of speakers, leaders, and participants in discussion of papers included many people of eminence in the fields of Education and Medicine, as well as two leaders of the International Sports Movement, Baron de Coubertin and the Earl of Meath. The half dozen forms or "systems" of physical training were ably represented by their leading exponents. The educational as well as the hygienic aspects of physical training were stressed by several speakers, especially by the scholarly, well informed Edward Mussey Hartwell, Ph.D., M.D. His masterly address on "The Nature of Physical Training, and the Best Means of Securing its Ends" was perhaps the highlight of the two days' sessions of the Conference, November 29 and 30. This address, followed by later addresses and writings, marked the beginning of a change in the conception of physical training to one of physical education.

Promoting the Physical Training Conference of 1889 might well be considered an outgrowth and essential part of Mrs. Hemenway's and Miss Homans' last and greatest educational project, the introduction of physical training in the schools of Boston, and the starting of the Boston Normal School of Gymnastics.

DEVELOPMENT AND PROGRESS OF BOSTON NORMAL SCHOOL OF GYMNASTICS

The following year, 1890-1891, the School was moved to commodious and well equipped quarters in Paine Memorial Hall at 9 Appleton Street. The courses of the preceding year were continued but advanced and expanded. The Senior class had real practice teaching with children (probably girls from an orphanage who came to the School). An additional teacher, Dr. Emma L. Call, had been engaged to teach General Anatomy, Physiology including Histology, and Hygiene in connection with Physiology.

In 1891-92 the program was greatly enlarged for both classes by addition of Anthropometry, Emergencies (first aid), Games, Voice Training for the Juniors, Psychology and Pedagogy, practice teaching in a nearby grammar school, and "practical talks on personal hygiene, dress, sanitation, and ventilation" by Miss Homans.

To handle the reorganized and expanded program seven teachers

were added to the staff: Dr. Josiah Royce, Professor of Philosophy at Harvard; Dr. H. P. Bowditch, Professor of Physiology and Dean of Harvard Medical School; Dr. W. M. Conant, Demonstrator of Anatomy, Harvard Medical School; Mr. C. O. Louis Collin, University of Lund, Sweden; Miss Clara Sheppard and Miss Margaret Wallace, 1891 graduates of B.N.S.G., Mr. F. C. Robertson, Trinity College.

In 1892-93 a course in Social Dancing was added to the Junior program taught by Miss Ethel Perrin, an 1892 graduate.

The 1893-94 school year saw another great expansion of the curriculum by the addition of six science courses: Physics, Chemistry, Biology, Comparative Anatomy, and Embryology in the Junior year; Physiology and a semester course in Sanitation for the Seniors. These courses were given at the Massachusetts Institute of Technology by members of the Institute faculty, viz: Professor William T. Sedgwick, Ph.D., M.D., Head of the Department of Biology, of world fame as the "Father of Sanitation"; Dr. Theodore Hough, eminent physiologist, author of "The Human Mechanism"; Dr. Robert P. Bigelow, also a member of the Department of Biology; Mr. Louis Derr, M.A., later Head of the Department of Physics; Mr. Fred L. Bardwell, B.S., Instructor, Department of Chemistry. During the fall of 1893 Dr. Hough gave a series of five inspiring lectures on Personal Hygiene to both classes. Later these lectures were given yearly to the Junior class only.

Although Miss Homans did not schedule a specific course, her subject (which might well have been called "The good life and how to live it") was too broad and complex for that, her teachings were as important as any part of the program to say the least. Her talks to students, individually and in classes, were based on and adapted to situations as they arose. She emphasized the importance of character and personality as prerequisites for successful teaching, supplemented by a professional attitude, dignity of behavior, with respect for and habitual practice of social amenities and usages. She pointed out the opportunities they would have, as teachers, to influence youth in many ways making for good citizenship, and urged them to use their opportunities. Always she tried to bring out the best in every student and usually she succeeded.

In the late fall of 1893 the new game of Basketball was introduced by one of the men students* of the class of 1895 who had played it the year before under the tutelage of Dr. J. H. McCurdy, and had been sent by Miss Homans to Springfield, Massachusetts, for a day's conference with Dr. Luther Halsey Gulick to get the latest information on the rapidly developing game.

The complete program of the School had now been fully organized. It was continued, with only minor changes, until the School was moved in 1897 to the building of the Massachusetts Charitable Mechanics

*The School was coeducational for about fifteen years. About a dozen men enrolled and eight graduated.

Association (Mechanics Hall) at 97 Huntington Avenue. It was a splendid program. Breadth and thoroughness characterized the theoretical courses, intensiveness and high quality the practice work. The teachers were exceptionally fine, personally and in the knowledge of their subjects and their teaching skill; many of them, then or later, eminent in their fields. And through it all Miss Homans' dynamic personality was guiding, coordinating, steadying; stamping on it all the impress of her principles and ideals of life and work, her standards of thoroughness and quality. She radiated an atmosphere of quiet, businesslike efficiency; of serious purpose and worth-whileness of the work, requiring and calling forth the best efforts of teachers and students alike.

During the twelve years the School was housed in Mechanics Building, the Physical Training movement made steady progress, in concept, objectives, scope, and content, to a point justifying the designation "Physical Education" which had begun to be used. Dr. Hartwell and other leaders, including Miss Homans, had early seen the educational values, actual or potential, of the work. Having this point of view, Miss Homans saw to it that the progress of the School kept abreast of the times, in essential respects. But she never plunged or allowed herself to be stampeded into questionable innovations. *Festina Lente,* "make haste slowly," was the motto of the school.

Dr. Enebuske resigned in 1898 and Dr. Collin took over his courses. In 1907 Dr. Hough was called to his Alma Mater, the University of Virginia, to head the department of Physiology and soon after was appointed Dean of Men. He was succeeded by Dr. F. H. Pratt. There were a few other changes and some additions to the teaching staff, among them Mr. M. B. Gilbert, a well-known teacher of Aesthetic Dancing, who gave courses to both Juniors and Seniors; Dr. W. W. Hastings, a faculty member of the Y.M.C.A. Training School, Springfield, Massachusetts, who gave a course in field and track athletics and Anthropometry for two or three years; and Miss Constance Applebee, a prominent English teacher of field hockey, the first to teach this game to women in the United States. Instruction in canoeing and tennis was also given. These activities were carried on two or three afternoons a week at the Riverside Recreation Grounds, about ten miles west of Boston.

About 1907 Miss Homans began to prepare for the union of the School with a college or university. By a provision in the will of Mrs. Hemenway, who had passed away in the spring of 1894, a Board of Trustees had been named and the School endowed to carry on for fifteen years, with Miss Homans as its director. At the end of that period, it was expected to become a part of "an institution of higher learning." Miss Homans considered several such institutions and came to the conclusion that the opportunity and the choice lay between

Simmons College and Wellesley College, and after protracted negotiations she decided on Wellesley College.

THE WELLESLEY YEARS

The transplanting of the School, making it the Department of Hygiene and Physical Education of Wellesley College, was an undertaking of considerable magnitude. To meet the needs of the School, as well as the undergraduate college work, required and voluntary, a new building was erected and equipped during the school year 1908-09 and the summer of 1909. The necessary funds were provided by one large gift from the Trustees of the School and another from a wealthy friend of it, whose name was not announced and was known only to a few people. The remainder of the cost was covered by gifts from other friends of the School, including a tidy sum contributed by its graduates. The complexities and difficulties of the situation required full play of Miss Homans' courage, resourcefulness, energy, organizing, and executive abilities to complete the task in time, so that the work of the school could be started when the College opened. The result no doubt gave her commensurate satisfaction. The commodious building, fittingly named Mary Hemenway Hall, was of good quality, simple design, harmonizing with its surroundings and the prevailing College architecture. It housed a large well equipped gymnasium, multiple and single showers, locker stacks and dressing rooms, a large room for corrective or other special work, and another, even larger, which was to be used for scheduled restricted work of college undergraduates, lectures by outside speakers, and other purposes; a branch library, lecture rooms, laboratories, and offices. All was ready when the College opened in the latter part of September 1909, the class of 1910 started its Senior year in Wellesley, and a fair sized Junior class was entered. Beginning in 1910, entering students were classed as "special students" and had to pass a college entrance examination or be certified by a preparatory school. Because of this, the classes of 1912 and 1913 were small. But the class of 1914 was one of the two largest after the School had moved to Wellesley, well above the average of the last eight or ten years in Boston.

During the first three years in Wellesley only slight changes were made in the program, chiefly increased outdoor activities, tennis, hockey, basketball, lacrosse, and field and track athletics. Required and voluntary work for the college students necessitated some additions to the teaching staff. In 1912, Dr. Pratt and Dr. Collin resigned and were succeeded, respectively, by Dr. Eugene C. Howe and the author. Some of the courses of their predecessors were modified or reorganized and some new courses were added.

The double function of the department greatly increased Miss Homans' work and responsibilities, organizing and scheduling freshman

and sophomore required work, persuading the Academic Council to give it at least half-hearted academic credit, securing improvement or enlargement of existing and addition of new outdoor facilities and equipment, and cooperation of the college physician and other administrative officers. While the president and a few members of the faculty were friendly and helpful, the attitude of the students and many faculty members, if not hostile, was one of cold indifference and aloofness. College students were said to refer, at times, to the professional students as "those H.P.E. things." Of course, Miss Homans commanded profound respect, often bordering on awe. At this time a patronizing and condescending or even contemptuous attitude toward teachers of physical education was not uncommon in colleges and universities. However, Miss Homans, the teaching staff, the good work and deportment of the professional students in a few years changed the attitude of college students and faculty to one of respect and led to acceptance on terms of equality.

In the spring of 1910 Miss Homans took the first step toward the formation, in 1915, of the Eastern Association of Directors of Physical Education for Women, by inviting the heads of departments of physical education for women in New England colleges to a meeting at Wellesley to discuss their common problems and exchange ideas. After the next four annual meetings of the same group elsewhere, the sixth meeting was again held at Wellesley and heads of departments in all Eastern colleges were invited to attend. The Eastern Association was then formally organized and has met annually ever since.

From 1890 the students of the School have had regular, supervised practice teaching, chiefly in public schools of city or town. In Wellesley they also assisted in the gymnastic class work and the outdoor sports of the college students. Instruction in methods of teaching gymnastics was given the first year of the School and ever since. Equivalent instruction in teaching dancing, games, and sports, including judging and refereeing the latter, was introduced as the program of activities was expanded. Health instruction, under Dr. Howe's guidance, was first given in the schools of the nearby town of Natick and of late in the Wellesley schools.

In 1917 the School reached the point in its development which Mrs. Hemenway and Miss Homans had envisioned thirty-five years before; it became a graduate school. The students in the entering class all had a Bachelor's degree from an approved college or university. Announcement of this change had been made in the department bulletin of the preceding year, and other forms of publication had also been used. But, as was expected, the enrollment dropped sharply and continued dropping until 1920, when the entering class of 1922 reversed the trend.

When Miss Homans had seen the class of 1918 through to its graduation, she retired, at the age of seventy, but still vigorous and

able as ever. She had made her decision some time before. She felt that her work would be completed when she had reached her goal of launching the School on its graduate course. In answering friendly protests she would sometimes say it was wiser to retire while still fully capable of continuing, instead of waiting until signs of declining powers made retirement necessary.

In recognition of her outstanding service to the college she was appointed Professor Emeritus of Hygiene and Physical Education. Students and graduates of the School expressed their loyalty and affection in many ways, even including gifts, which Miss Homans had always disapproved on principle when students had wished to tender them to herself or teachers, but which she graciously accepted when presented at the annual alumnae luncheon of 1918. One of these gifts was an extensive trip which she made the following fall. It included the middle west, and on it she visited a great number of graduates in schools, colleges, universities, and Y.W.C.A.'s. They gave her a warm welcome and eagerly listened to her inspiring talks, chiefly about the rapid progress of physical education, its widening scope, and its increasing opportunities for service. She urged them to make their contributions to this progress. After her return to Wellesley, where she continued to make her home, she kept in close touch with the School, received and entertained teachers, students, and graduates as well as people who came from all parts of the country, often to seek her advice or opinion.

The following year she helped a graduate, Miss Helen McKinstry, to establish the Central School of Hygiene and Physical Education in New York City, and consented to serve as its Advisory Director for a number of years. During this second year of retirement she also started a campaign to raise funds toward a swimming pool. Beginning in 1923 and continuing for a few years she met each of the classes of the department's graduate students regularly for planned lectures, and also entertained them in small groups at her home.

Every year Miss Homans spoke to groups of graduates at their meetings, on festive or other occasions. Usually the topics concerned the advance of physical education and the increasing contribution of the graduates to this growth; sometimes she told them of the early struggles and rapid development of the School and restated the principles, standards, and ideals on which its founding and progress was based. A few times during the 1920's she addressed larger audiences at Wellesley College. In 1925 she helped in a drive to raise money for a Loan and Scholarship Fund started by the Alumnae Association of the School. With all these, and other, activities, and a voluminous correspondence, she was kept quite busy during the years of her retirement up to the spring of 1933.

In 1909 Miss Homans had been honored with an M.A. from Bates

College. In 1930 she received the degree of Doctor of Pedagogy from Russell Sage College.* The following year she received the Honor Award — Fellow of Physical Education — of the then American Association of Physical Education.

In the spring of 1933 Miss Homans fell ill. At first it did not seem to be anything serious and there was a temporary improvement. But after a short time her condition grew worse, and on October 29 of that year she passed away.

In the last of a series of Vignettes* on Miss Homans, Miss Helen McKinstry writes:

> September 1933. A frail and pain-racked body from which a mighty spirit is struggling to be freed. Perhaps she is sleeping. She seems quiet now. Lids lift from tortured eyes—"What is the meaning of it all?"
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>
> Leaves are falling for the eighty-fifth time since a great soul came to bless the earth; to walk the rough path of the pioneer; to dream dreams and see visions; to make those dreams come true; and to mold and enrich the lives of hundreds of women. The last link in the chain is broken and the great spirit is free — freed to "learn the meaning of it all" and "carry on."

To the hundreds of graduates who had received their professional training under Miss Homans' direction, and those who came to know her during the years of her retirement, the news of her passing was a severe shock. Less than a year before she had still seemed vigorous, energetic, and buoyant, physically and in spirit; keenly interested in life in general, in physical education and the department in particular. Those of us who knew her intimately had hoped, and expected, that she would remain with us for a number of years. And now she had gone to her rest, leaving a void in our lives that nothing could ever fill. But the ideals she had fostered, the standards she had upheld and the traditions she had established would live, passed on by the graduates to their students and children, continuing her influence in ever widening circles.

REVIEW OF MISS HOMANS' CHARACTER AND PERSONALITY

Splendid natural endowments and favorable early environment combined with sound training to mold a strong character, firm and uncompromising in matters of principle, on questions of right and wrong, of individual responsibility and personal integrity; steadfast and unswerving in achieving the goals her keen intelligence, far-seeing vision, and sagacious judgment had set. Reaching maturity and assuming serious responsibilities as a teacher and principal at a comparatively early age accelerated the development of a dynamic personality re-

* The Central School of Hygiene and Physical Education, which she had helped to start in New York City, was made a department of physical education at Russell Sage College in 1929.

* Mary Hemenway Alumnae Association Bulletin, 1934–35, page 20.

flecting her vigorous, active mind and her sane balanced view of life; a personality well poised, wholesome, gracious, stimulating; with innate dignity, courtesy, and charm, all outward expressions of an eager, dauntless, generous spirit. Her many contacts with men and women in the world of affairs, in the field of education, and in society had given her a keen insight into human nature, a remarkable sureness and skill in meeting and dealing with people, from the highest to the humblest. In conversation or talks to groups she was always interesting and direct, easily held the attention and often swayed opinions, clarified misunderstandings and confusion of ideas and stimulated ambition to strive for the things she considered essential for the general good and for the individual's best interests. As Mrs. Hemenway's executive secretary for many years she had gained wide experience in organizing, directing, and administering various educational projects of increasing magnitude. This, coupled with a commanding personality, made her an exceptionally able, successful administrator and executive.

Miss Homans' view of life and work was broad and liberal. She was scornful of a narrow-minded attitude, of pettiness, cheap and tawdry things, ostentation; she frowned on unseemly, boisterous, or undignified behavior. She stressed the importance of self-respect, self-control, and dignity; of good taste, grooming, and manners of well-bred people. In all these matters she set her students a good example. She never hesitated in calling their attention to remissness in any one or more of these matters—for which many of her graduates are everlastingly grateful.

While Miss Homans' working life was rich and satisfying, filled with large undertakings and achievements, her private life was one of quiet, serene domestic happiness. From the time she came to Boston, or soon after, she had made her home with her beloved, devoted younger sister, Miss Gertrude Homans, who relieved Miss Homans of domestic responsibilities, ministered to her material needs and comforts, and often gave her sound advice in difficult situations or important decisions. In all these ways she contributed to Miss Homans' success.

About 1892 or 1893 the sisters assumed full responsibility for the care, bringing up, and education of a nephew and niece, then about ten and eight years of age respectively. These children grew up into fine manhood and womanhood. They were always loyal and devoted to their aunts and appreciative of their loving care and excellent training.

Miss Homans did not care for social prominence or display. She entertained her friends quietly at home and was a most charming and gracious hostess. But when occasion called for it she was unsurpassed in the planning and successful management of larger social functions, held in hotels or in the gymnasium of the School. These affairs were usually luncheons or dinners for graduates, sometimes for groups of educators, or leaders in physical education.

One of Miss Homans' many talents was the gift of clear, succinct statement, oral or written. Because she really had something to say, marshalled her points effectively, phrased them in beautiful impeccable English, with well modulated voice and intonation, the total effect was singularly impressive. This was true to a considerable extent even in ordinary conversation. It no doubt contributed in no small measure to her marked influence on all with whom she came in contact, students, her associates, friends, visitors, and even total strangers.

It remains for those who had the privilege of receiving her precious counsel, guidance, and inspiration to pass them on to other generations of youth and teachers of youth. Thus the results of the great life work of her whom we respected, admired, revered, and loved will constantly grow in magnitude and increase the value of the contribution to their country's progress and welfare which Miss Homans and her friend Mrs. Hemenway deliberately set out to make.

Contributed by WILLIAM SKARSTROM
Professor of Physical Education,
Emeritus, Wellesley College

Eliza Maria Mosher, M.D.

"The History of American Medical Women," by Eliza M. Mosher, M.D., began in "The Medical Woman's Journal," October, 1922 (Vol. XIV, No. 10, p. 253). This History continued somewhat irregularly as late as January, 1924.

This series of medical biographies was preceded by a sketch of Dr. Eliza M. Mosher (see below). Reference should also be made to the story of her childhood illustrated by pictures to be found in "The Medical Woman's Journal," May, 1925, pp. 122–129.

"THE HISTORY OF AMERICAN MEDICAL WOMEN"

By ELIZA M. MOSHER, M.D.
Brooklyn, N. Y.

"The 'Medical Woman's Journal' is presenting, for the first time in concrete shape, a history of the pioneer medical women of America. This history was prepared for and presented in part at the Convention of the International Medical Association, held in Geneva, Switzerland, September 4–7, 1922, by Dr. Eliza M. Mosher, of Brooklyn, N. Y., whose history we present first. We do this because of her recognized position as the Dean of American Medical Women; having spent fifty years of her life in the practice of her profession and in service to humanity; because it was from her fertile brain that the first suggestion of an International Association emanated; because during her long career as a practicing physician she has always been imbued with a high ideal for the women members of the medical profession. Dr. Mosher is the Senior Editor of the 'Medical Woman's Journal,' her connection in that capacity having begun in January, 1909.—(MGR. EDITOR.)

ELIZA M. MOSHER began medical study in 1869 at the New England Hospital for Women and Children, and in the office of Dr. Lucy E. Sewall, attending physician at the same hospital.

"In 1871 she entered the medical department of the University of Michigan. While a two-year course was sufficient to obtain a diploma at that time, she elected a three-year course. At the beginning of the second year she was asked to serve as assistant demonstrator of anatomy and quiz master for the women's class. In order to do this she elected a four-year course and devoted her second year mainly to anatomy under Professors Ford and Frothingham.

"Desiring better clinical advantages than the University afforded at this time, she spent the third year of her course in New York City, matriculating at the Woman's College of the New York Infirmary, but spent much of her time attending clinics at Bellevue Hospital, DeMilt Dispensary, and elsewhere. She returned to the University of Michigan for her last year of study.

"In the autumn of 1877 the Massachusetts State Reformatory

Prison for Women at Sherborn was completed, and Dr. Mosher was called to become its resident physician. The organization of a hospital of sixty beds from its very inception required executive ability as well as medical skill and training.

"In 1879 Dr. Mosher resigned her position in favor of her assistant, Dr. Lucy Hall, and went abroad for a year of medical study. In London she saw laparotomies performed for the first time. Carbolic acid was sprayed continuously across the opened abdominal wound during these operations. She studied the diseases of children at the Great Ormond Street Children's Hospital, attended the clinics of Sir Andrew Clark on the chest, and Sir Morell Mackenzie at the London Throat Hospital. In Paris she studied diseases of the eye under M. Panas. She joined a class of foreign physicians in practical surgery under M. Fort, and spent much time at Hotel Dieu following clinical professors of the medical school.

"On returning to America in 1881 to resume the private practice of medicine, Dr. Mosher received letters and telegrams calling her immediately to Boston. The superintendent of the Reformatory Prison had been removed, and Governor Long urged Dr. Mosher to accept the position left vacant, saying, 'You are the only woman I am willing to appoint; and to put a man at the head of the prison, as I must if you refuse, will set back the work of women in Massachusetts twenty years.'

"Dr. Mosher at once introduced a 'grading and marking system,' to stimulate the inmates of the prison to greater effort at self-control. She adopted a plan of cumulative punishments for misdemeanors that greatly reduced the infraction of prison rules. She added a probation department whereby each new prisoner was separated from the others for a definite period, during which she was brought under the personal influence of the officers and the chaplain. After two and one-half years she resigned the position, and with Dr. Lucy Hall, who had succeeded her as physician of the prison, located in Brooklyn, N. Y., to enter upon the private practice of medicine.

"Before two months had passed the position of resident physician at Vassar College became vacant, and Dr. Mosher was asked to take it. She refused unless the president and trustees would permit her to serve on half time in alternation with her associate, Dr. Lucy Hall, and this only until Brooklyn practice should demand the full time of both doctors. Her conditions were accepted, and the autumn of 1883 found her at the college making a careful physical examination of the freshmen girls and recording the same with their family history. This was the first time in the history of women's colleges in this country that such a record had been made by a college physician.

"Together with the gymnasium teacher Dr. Mosher replaced the old calisthenic drill with its cumbersome skirt for the Sargent system of physical training with its painstaking measurements and its more suitable divided skirt.

"In 1896 an urgent call came to Dr. Mosher from the University of Michigan to inaugurate the work of a dean of women, and to establish a system of physical education for women students in the Barbour gymnasium just being completed. With these a full professorship in hygiene was offered in the Department of Literature, Science, and the Arts. Reluctantly again she laid aside the practice of medicine, and, although it involved a large pecuniary loss, she turned heart and soul into work for her Alma Mater.

"In accepting the position at the University, Dr. Mosher explicitly stated to President Angell that she would remain until the work to which she was called was fully organized—probably no longer, as her chosen field was the practice of medicine. At the end of six years this work was accomplished, and she tendered her resignation, so that she might return to her office in Brooklyn, where work awaited her coming, and in which she has been actively engaged since that time.

"During the twelve years which have elapsed, Dr. Mosher has been a lecturer on hygiene at Adelphi College for Women; on anatomy, physiology, and hygiene in the Union Missionary Training Institute, located in Brooklyn; and has lectured at Mt. Holyoke College to the freshman classes.

"Dr. Mosher was associate founder of the 'American Posture League,' New York City, and has been chairman of one of its most important committees since its inception. She has been an active member of the War Committee of the 'Medical Woman's National Association,' of which she is honorary president. The work of this committee, under the name 'American Woman's Hospital,' still continues because of the great need for medical women in the devastated regions of Serbia, Turkey, Asia Minor, and Russia. Upward of one million dollars have been raised and expended, and medical women with able corps of nurses have rendered a very great service to the sick and suffering of those countries.

"Dr. Mosher spent four years in intensive study on the relation of habitual postures to the health and symmetry of the body during the early part of her work in the School of Physical Education at Chautauqua. This study has made her an authority on this subject in America.

"During the last ten years Dr. Mosher has been making a careful clinical study of the abdomen and its contents with special reference to enteroptosis, its prevention and correction, and her papers have added materially to the knowledge of this important subject.

"Dr. Mosher is a member of A.M.A., the New York State Medical Society, the Medical Association of Greater New York, the Medical Society of the County of Kings, the Brooklyn Pathological Society, the American Medical Milk Commission, etc.

"She has written a book, 'Health and Happiness, a Message to

Girls,' Funk & Wagnalls Co., publishers, and a very large number of papers all of which embody original observation and work."

PUBLICATIONS OF ELIZA M. MOSHER, M.D.
(This list may be incomplete)

In Dr. Eliza M. Mosher's letter of January 11, 1922, she wrote:

I am now writing "A Retrospect of Fifty Years of Medical Study and Practice," or some such title. This to be the Introduction ? to a book entitled "Thirty Years' Wanderings in Medical Highways and By-ways, A Collection of Papers written, etc."

I find I have sixteen or so Papers most of which having been original studies are as new and up to date today as when written, and will enable me to get them into the country libraries, as a record of one Woman Doctor's work.

No such publication has been found. Possibly this was a plan which she did not carry out.

One of the early papers, "A Critical Study of the Biceps Cruris, etc.," has no date for its publication in the Annals of Surgery. Miss Bancroft, in the Medical Woman's Journal, May, 1925, writes: "When published, this study attracted the attention of Oliver Wendell Holmes and other great medical educators." This would date the paper probably in the eighties.

Another undated publication is "Habitual Postures of School Children." This paper was reprinted.

The remainder of Dr. Mosher's publications are arranged in order of date of first publication where this date is known.

Dr. Mosher was Editor of the Medical Woman's Journal for more than twenty years. In this list are included some editorials and reviews which were signed by Dr. Mosher.

"A Critical Study of the Biceps Cruris Muscle as It Related to Disease in and around the Knee Joint." *Annals of Surgery*. Reprinted in the *Med. Woman's Journ.*, Aug. 1922, Vol. 29, No. 8, pp. 164–169.

"The Health of Criminal Women." *Boston Med. & Surg. Journ.*, Oct. 5, 1882; Med. Woman's Journ., Jan. 1923, Vol. 30, No. 1, pp. 7–10.

"Habitual Postures of School Children."

"Influence of Habitual Posture on the Symmetry and Health of the Body." *Brooklyn Med. Journ.*, July, 1892; *Annals of Hygiene*, March, 1893, Vol. X, pp. 144–158.

"Habits of Posture a Cause of Deformity and Displacement of the Uterus." *N. Y. Journ. Gynecology and Obsterics*, 1893; *Med. Woman's Journ.*, July, 1909, Vol. 19, No. 9, pp. 245–248.

"The Human in Medicine, Surgery and Nursing." *Med. Woman's Journ.*, April, 1910, Vol. 20, No. 4, pp. 71–76.

"Dr. Elizabeth Blackwell." *Med Woman's Journ.*, Aug., Sept., and Oct., 1910, Vol. 20, Nos. 8, 9, and 10.

"Elizabeth and Emily Blackwell." *Med. Woman's Journ.*, April, 1911, Vol. 21, No. 4.

Health and Happiness for Girls. New York and London: Funk & Wagnalls Co., 1912. Pp. 203.

"An Enteroptosis Belt." Med. Woman's Journ., Jan., 1914, Vol. 24, No. 1, pp. 14–15.

"The Etiology and Diagnosis of Chronic Intestinal Stasis." *Med. Woman's Journ.*, January, 1941, Vol. 24, No. 1, pp. 1–3.

"Faulty Habits of Posture, a Cause of Enteroptosis." *International Journal of Surgery*, May, 1914; *Med. Woman's Journ.*, Feb., 1915, Vol. 25, No. 2, pp. 27–30.

"The Care of the Abdomen in Infancy and Childhood." *N. Y. State Journ. Med.*, Dec., 1914.

"Review of Dr. William Seaman Bainbridge's Book 'The Cancer Problem.'" *Med. Woman's Journ.*, June, 1915, Vol. 25, No. 6, p. 131.

"Benign Neoplasms of the Breast in Women." *Med. Woman's Journ.*, July, 1915, Vol. 25, No. 7, pp. 151–152.

"Exercises to Aid Digestion, Prevent Constipation and Strengthen the Abdominal Walls." *Med. Woman's Journ.*, Feb., 1916, Vol. 26, No. 2, p. 48.

"First Annual Meeting of Medical Women's National Association With Portrait of Dr. Eliza M. Mosher (Honorary President). *Med. Woman's Journ.*, May, 1916, Vol. 26, No. 5.

"The Value of Organization—What It has Done for Women." *Med. Woman's Journ.*, June, 1916, Vol. 26, No. 6.

"Intestinal Stasis; Its Cause, Prevention and Treatment." *N. Y. Med. Journ.*, October 28, 1916.

"A Patient's Own Story of an Attack Diagnosed as Cerebro-Spinal Meningitis Forty-nine Years Ago Reported." *Med. Woman's Journ.*, Nov. 1916, Vol. 26, No. 11, pp. 266–267.

"An Uncomplicated but Extreme Case of Enteroptosis with Treatment and Recovery." *Med. Woman's Journ.*, May, 1917, Vol. 27, No. 5, pp. 100–101.

Relation of Posture to Health. Read before the Amer. Posture League, July 5, 1917.

"Habit Postures in Relation to Pelvic Conditions." *Med. Woman's Journ.*, Sept., 1917, Vol. 27, pp. 198–199.

"Habits of Posture as Related to Health and Efficiency." *International Journal of Surgery*, 1919, Vol. 32, pp. 40–45; also *Med. Woman's Journ.*, Dec., 1919, Vol. 29. No. 12, pp. 243–245.

"Physicians' Creed." *Med. Woman's Journ.*, Nov., 1919, Vol. 29, No. 11, paragraph page 238.

"What is a Good Fatigue Reducing Chair and Footrest?" *National Safety News*, May 24, 1920, Vol. I, No. 337, p. 2.

"Guide Posts on the Road to Health." *Med. Woman's Journ.*, March, 1921, Vol. 28, No. 3, p. 69–70.

"One of the Pioneer Women in Medicine." *Med. Woman's Journ.*, March, 1921, Vol. 28, No. 3, pp. 75–78.

"The Mobile Colon: Its Cause, Effects and Correction." *N. Y. Med. Journ.*, May 18, 1921; also *Med. Woman's Journ.*, June, 1921, Vol. 28, No. 6, pp. 137–140.

"The History of Medical Women." *Med. Woman's Journ.*, Oct., Nov., 1922, Vol. 29, Nos. 10 and 11; Jan., Feb., Mar., May, June, 1923, Vol. 30, Nos. 1, and 2, 3, 5 and 6; Jan., 1924, Vol. 31, No. 1.

"A Method of Emptying the Stomach by Muscular Pressure." *Med. Woman's Journ.*, January, 1922, Vol. 28, No. 1, pp. 1–4.

"The New York Infirmary for Women and Children." *Med. Woman's Journ.*, March, 1923, Vol. 30, No. 3, pp. 81–82.

"New England Hospital for Women and Children." *Med. Woman's Journ.*, June 1923, Vol. 30, No. 6, pp. 178–183.

"Social Pathology, A Review." *Med. Woman's Journ.*, Nov., 1923, Vol. 30, No. 11, pp. 349–350.

"An Anatomical Cause for Enteroptosis and the V Colon." *Medical Press and Circular*, London, Nov. 14, 1923, pp. 401–404; *Med. Woman's Journ.*, April, 1924, Vol. 31, No. 4, pp. 94–96.

Clelia Duel Mosher, the Scientific Feminist

ABILITY and circumstance, so often in opposition in the making of a woman's destiny, now and then in conjunction produce an exceptional fortune. Although Clelia Duel Mosher, born in December of 1863, "the darkest hour of the Civil War," as her mother said, was an unhappy baby, delicate and with tubercular tendencies, she survived to become a fortunate and distinguished person.

If one looks back over the long train of her Alsatian-Huguenot and Norman-French ancestors and their descendants among American Colonials, one must think she was predestined to be at least exceptional, whatever the obstacles. In that company were William Deuell and his wife, freeholders of the town Rehoboth who were proscribed "for the continuing of a meeting upon the Lord's Day from house to house, contrary to the order of the Court."

Of her mother's line the most picturesque was the Reverend Blackleach Burritt, a graduate of Yale College in 1765 and a convert of the Evangelist Whitfield, who became a liberal Presbyterian minister. He married Martha Welles, a granddaughter of the distinguished Governor Thomas Welles of Connecticut. He was a zealous Whig and during the Revolution often took his musket into the pulpit for defence. In June, 1779, the town of Greenwich, Connecticut, was raided in the night by the British, who carried off all the livestock and twelve prisoners, among them the Reverend Blackleach Burritt, "a most pestiferous rebel priest and preacher of sedition." The soldiers would not allow him time to put on his clothes and his wife followed with them begging the officer in command to return to her two milch cows. They halted to let the minister dress, cursed her, and gave back one cow.

While in the old Sugar House Prison in New York City Blackleach Burritt was instrumental in saving the life of William Irving, the father of Washington Irving, by giving testimony to his patriotism. But he died prematurely of revolutionary hardships, leaving fourteen children; and of his sixty grandchildren, a century later, there were only fourteen living. Though a visionary and regarded as unpractical, he was to be remembered. He loved a pious argument, was a fine singer and an eloquent preacher; and, as might have been expected, was almost indifferent to mundane affairs.

From such prolific English and Welsh stock, Clelia Mosher had, also, through her mother, three other ancestors, a Gorham, a Howland, and a Tilley, who came over in the *Mayflower*. Her last foreign ancestor arrived in Philadelphia in 1855 and from the seventeenth century onward there was in almost every generation one or more doctors.

But all her father's origins go back to France when Duel was spelled De Ville or Davol and Mosher was a variation from Mosier or Motier. Some were Huguenots exiled to England, others were Quaker pacifists who fled to Canada from the Colonies, leaving Cornelius, her great-grandfather, a mere boy who promptly enlisted in the Continental Army. The potentialities of her blood emerged when her grandfather, Christopher Mosher of Albany County, sold his farm to educate his children. Three of them became physicians, one a surgeon-general, and one daughter a portrait painter. Among his grandchildren there were two University professors, two distinguished physicians, an episcopal bishop of the Philippines, and a woman missionary to China. Among the great-grandchildren there is already one diplomat and an editor and playwright.

Clelia Mosher was thus destined to be "somebody" if opportunity served and from the history of her forebears a formula might almost have been made for her curiously contradictory abilities. She should inevitably be a scientist, as it proved, a doctor of medicine; probably an administrator, somewhat artistic, and certainly a non-conformist and a questioner of authority. Whether she would attain distinction depended on her physical endurance, and the attitude of her parents and their social circle toward talented girls.

Her father, Dr. Cornelius Duel Mosher, for a lifetime a medical practitioner of Albany, New York, was an authority on insanity, a member of the Board of Education, and a scholar who accumulated one of the best private libraries in the State. When his younger daughter died, he concentrated his attention on the education of Clelia, the one remaining child. Like the father of Elizabeth Cady Stanton, he must often have regretted that his clever daughter was not a boy.

Contrary to the average doctor of his time he had more than usual respect for the powers of women; but he was convinced that his daughter was too delicate to go to college and, though she had some artistic talent, he thought it not enough to warrant the serious study of art. But he sent her to an excellent girls' school in Albany and, because he was a man of wide culture, he encouraged her to read and hear everything of literary value. From her childhood she saw all the best plays and, after her sister's death, the little greenhouse which had been attached to the house for the invalid's pleasure became an educational laboratory. Here Clelia was instructed in elementary botany by her father and in gardening by the local florist.

Like most girls in the eighties she had no professional foundations, mathematics and the advanced sciences had been almost wholly neglected. But already she wished to become a doctor. It was then customary for the professional candidate to read medicine with some well-known physician and observe his cases. When thought to be sufficiently prepared he submitted a statement of his qualifications to some medical

school where his courses were adjusted to his previous experience. But when Dr. Mosher gave his daughter a technical book on the nervous system as a beginning, she was at once conscious of the inadequacy of her preparation and determined to go to college.

To do this she must earn money and at the same time prepare for entrance examinations by teaching and doing graduate work in a private school. The greenhouse and garden were turned into a commercial project and in three years, having earned and saved two thousand dollars, she went to Wellesley College without the approval of her father. His objections on the ground of health were nearly justified, for her college entrance preparation was inadequate, she had seriously overworked, and she came near to nervous collapse before the end of her Freshman year.

But at Wellesley and later at Cornell, she made friends whose fortunes led them and ultimately her, to California, to the new University established by Senator and Mrs. Stanford, where she completed her course. Her health had greatly improved and she was still as determined as ever to study medicine. At Stanford she breathed the air of liberal science and was encouraged by a young and eager Faculty in what proved almost at once to be her major interest—research.

A minor study in the wing-veining of butterflies, which became in part the basis of Comstock's classification, and a thesis on the circulation of the hag-fish, gave her an elementary laboratory technique; but the subject which was to become the fundamental pursuit of her life, suddenly took shape because of her incorrigible scientific curiosity and her disposition to question every statement about the physical incapacities of women.

As assistant in hygiene at Stanford, she was taking measurements of women students. One day she came home to a married women friend and asked abruptly, "Do you breathe costally or diaphragmatically?"

The friend replied. "I suppose diaphragmatically, because I have never worn a corset and have had special breathing exercises for singing." Here was Miss Mosher's first exception.

The statement in current physiologies in 1884 was that women breathed costally, not diaphragmatically as men do, probably as a provision for carrying the child during gestation. On the basis of three exceptions she questioned its accuracy. She traced the dictum back sixty years to a certain Dr. Hutchinson in England who had examined into the vital capacity of 2430 men—soldiers, sailors, policemen, pugilists, wrestlers, and 97 gentlemen—and twenty-six girls. These girls he had examined largely by sight and touch and by making shadow pictures of them.

To Miss Mosher's critical young mind this basis was wholly inadequate for the conclusion drawn concerning the costal breathing of women. She set out by the most scientific methods known to physical

training and laboratory science to examine children and some women without clothing and collected a total of 84 cases, women and children and five men, adding later, observations on fifteen pregnant women in a rescue home. She finally reached the conclusion that "there is no sexual difference in the type of respiration." This research and its conclusions, submitted for the Master's degree at Stanford University in May, 1894, was corroborated by Dr. G. W. Fitz of Harvard in an extensive monograph on Types of Respiratory Movements, published in 1896.

Thus an all but unknown young woman was the first to controvert successfully one of several erroneous theories then held in regard to the physiology of women. But the fact remained that many women did breathe with the upper chest and both Mosher and Fitz were convinced that constricting clothing was the most potent factor in the production of the costal type of breathing.

This led Miss Mosher to study the effects of fashion and clothing on the health of young women. In 1896 she showed that the average width of skirts worn by ninety-eight young women was thirteen and a half feet and that the weight of the outside skirt alone was often as much as the weight of the entire clothing worn in our day. Moreover several under-petticoats were carried from the waist, which at that period had to be compressed to wasp-like proportions.

Her position as assistant in Hygiene and examiner in the gymnasium gave opportunity to focus her attention on the major problem of functional periodicity in women, which was then thought to be a permanent handicap to their efficiency in any fields preëmpted by men. One writer had described menstruation as "a constantly recurring infirmity that occupies seven years out of thirty of an adult woman's life." In her undergraduate years she had already undertaken, with the thoroughness which is her gift, to discover whether this limitation was indeed inevitable.

She determined to find out what constituted "normal" menstruation, what factors were making it, as she believed, abnormal, and how these factors could be modified. She suspected that the previous researches of physicians, largely based on their experience of pathological conditions in women patients, distorted the facts and she therefore limited her observations to average healthy individuals. She invented more accurate apparatus and prepared a detailed questionnaire which she gave to each girl to be kept monthly. As the work developed year by year she added to the long list of college girls many married women, living on the campus, who kept their record with interest and with great care.

When her first *Preliminary Note* was published in 1901 she had serial menstrual records of four hundred average women, extending collectively over more than 3350 menstrual periods, supplemented by physical examinations and her own intimate knowledge of the condi-

tions under which these women were living and working. Her tentative conclusions were that monthy disability was due to four factors: constricting clothing, inactivity, constipation, and the general assumption that discomfort if not pain was inevitable.

It must be remembered that this modest publication was merely a by-product of an exceedingly busy professional life. How long any such investigation might take was of no consequence to her, she was collecting the facts and in no hurry for recognition or publication. At long intervals she printed these cautious preliminary notes, to preëmpt the field and her conclusions, until she should have completed the foundations for an impregnable position.

Although her health was somewhat precarious, she was always overworked and her salary was meager, she was more and more determined to study medicine to prepare herself for higher researches. Refusing offers of better-paying positions she borrowed from her mother, who had always maintained an unselfish and sympathetic attitude toward her ambitions, and went with two other Stanford women to Johns Hopkins Medical School.

In the vital atmosphere of this recently founded institution she found at once sympathy for the researches into the physiology of women which had now become her major interest. The women medical students were courteously treated in all professional matters, although the prejudices of the young men and of Southern society against women doctors then precluded social contacts between men and women students.

From a coterie of brilliant professionals—among them Osler, William Welch, Simon Flexner, Howell, Howard Kelly, Halstead, Abel, Mall—she received instruction. In spite of the exhausting demands of medical training she gradually learned to take care of her health properly and came through the four years with a good record. She was not a brilliant student but, as one of these men said, she had a talent for getting at the heart of things. On graduation she was appointed externe in the Johns Hopkins Dispensary and gynecological assistant in Dr. Howard's Sanitarium.

At the end of that year she opened an office for practice in Palo Alto, California, then a very small town at the gates of Stanford University. A few years later she made a home there with the Mosher Library and the old family furniture, and brought her aged mother from New York to live with her. But as might have been expected she found it difficult to make a living.

The countryside was sparsely settled and the few established physicians turned over to her their dead-heads and neurasthenic women. Her time was filled, with very little coming in. She was, as frequently in lesser matters, too thorough. Whether her patients were important or able to pay or not, she gave them meticulous attention, and she missed

the scientific cooperation she had had from the staff at Johns Hopkins. Beekeeping, gardening, and housekeeping were pleasurable, but they took too much energy. Gradually, however, she built up a practice among women and children and for perhaps the first time since early youth she had time for a normal social life among cultured neighbors.

Her researches in functional periodicity and her medical treatment for disability in women had meanwhile become widely known and were being adopted. On a larger basis of 2,000 cases, covering 12,000 periods, she had fully proved her earlier conclusions; that in a majority of cases painful menstruation is congestive in type and unnecessary. She showed conclusively that it was produced by the upright position; by disuse of the diaphragm and the abdominal muscles; by lack of general muscular development; by inactivity during the monthly period; and, finally, by the tradition and general assumption that pain and discomfort were to be expected, that it was an illness rather than a normal function.

By 1910 these facts and their implications were already past history and Dr. Mosher was eagerly attacking the practical problem of remedies for women's disabilities. For an opportunity to make further observations and experiments, she gave up practice temporarily, and took the position of Medical Adviser to Women and Director of the Roble Gymnasium at Stanford. She devised a system of exercises for preventing pain and for shortening the length of the monthly period which, when continued over a sufficient time, produced striking remedial results. These have now been generally adopted in women's gymnasia and are often referred to as "Moshering."

As part of the corrective treatment she had insisted, as early as 1894, on the abandonment of stiff corsets, the wearing of lighter clothing and sensible shoes, and encouraged athletic activities such as girls had rarely taken part in—tennis, swimming, hiking, bicycling, horseback riding and, most dangerous of all or so regarded then, basketball. Perhaps the first match game ever played, before an audience of women, was brought off under her leadership in 1896, in San Francisco, between the girl-teams of Stanford and the University of California. The daily papers, heralding this first intercollegiate game, printed pictures of wasp-waisted bloomer-clad figures in amusing attitudes, which were copied by the weeklies and even by St. Nicholas magazine.

Thus in her own time she had seen discarded the second of the century-old theories respecting the physiology of women. Her researches and her remedial treatments had now provided both facts and methods. They led the way in the general movement for the physical emancipation of young women, which was by this time becoming widespread.

By natural evolution, Dr. Mosher, in her medical practice, had observed also the disabilities of older women and the vagaries of the menopause. The climacteric, or change of life, was then looked upon by physicians as a critical period when "mental disorders were apt to

supervene, resulting in abnormal behavior," and all women looked forward to it with apprehension. No extended research was required to convince Dr. Mosher that this, too, was in great measure unnecessary and avoidable. Applying the same logic and the same methods as in the case of girls, she concluded that these troubles, when no organic disease existed, were largely due to physical inactivity and a nervous letting go of self-control, and to social and family changes incident to middle-age.

Some paragraphs from her book on *Personal Hygiene for Women* deserve to be quoted as showing Dr. Mosher's scientific and yet sympathetic attitude toward the problems of middle-aged women:

> If the woman has been the mother of a family, her family has grown up, her period of financial stress and effort in helping build up the family fortunes is over. If she has had intellectual interests earlier in life, too often she has dropped them. She is confronted with the loss of her usual occupations and an absence of all necessity to exert herself; and at the same time her attention is directed unduly to her physical discomforts be they small or great, or be they only a mere consciousness of altering conditions.
>
> Her condition is almost exactly analogous to that of an active man who stops business in middle life. Dr. Archibald Church has called attention to the nervous and mental disturbances of the male climacteric.
>
> Why should we be surprised when women have the same, with even greater reason? Without absorbing occupation, without mental diversion, and encouraged by the sympathetic pity of friends, she lets herself go to pieces nervously and spends a period of years in wearing out her family and finding life not worth living . . .
>
> The women who have absorbing occupations, who are vitally necessary to the world, are the ones who get through this period comfortably. A prominent woman physician declares that not a single woman physician of her acquaintance has gone to pieces at the change of life. Among a considerable number of women teachers and authors, and women who have carried the burden of being the mother of a family while occupying a salaried position, through the menopause, not one has had to quit work from this cause. Four have certified that the research work which has brought them distinction was done without any inconvenience whatever during these years.

When Dr. Mosher was past fifty years of age America began to take part in the World War. Absorbed in her scientific work, spending her leisure in her lovely garden, she was suddenly shocked by stories of the mutilation of men and the girdling of fruit trees in France. She began to think the war her concern. But there seemed no way for her to give her service, until a doctor under whom she had worked at Johns Hopkins unexpectedly arrived at Stanford. He made her qualifications known to the proper Red Cross authorities and a few weeks later she was on her way to work with refugee children under Dr. William Palmer Lucas.

In New York she wrote a series of letters to her aged mother to be

forwarded at intervals to bridge over the long silence that would otherwise fall before she could send news from France. She sailed on a freighter, with soldiers and consignments of ammunitions, at a time when submarines were very active.

As assistant and later associate Medical Director of the Bureau of Refugees and Relief, other duties were soon added: and her initiative, her administrative tact and experience caused her to be given all sorts of emergency jobs which often compelled her to travel nights and work daytimes. She investigated places for locating children outside of Paris, taking on one occasion sixty small children from Paris to Evian, a hectic journey of two days.

In her periods of leave she served as postal clerk and, because she could not endure the look of despair in the eyes of those for whom she had no mail, she and other volunteers sorted and distributed tons of belated letters and packages. Her life, like that of other war-time social workers, was a continuous emergency not to be described, and going on for fifteen months until the February after the Armistice.

Some time afterward her chief, Dr. William Lucas Palmer, expressed himself on the value of her service in these warmly appreciative terms:

> She was particularly fitted for her work in the Children's Bureau in France because of her quiet, sympathetic approach to human beings and human problems. In all the delicate work of adjustment between American helpfulness and French willingness to be helped, I found her invaluable. Her sense of humor gave her the necessary poise in trying situations.

Dr. Lucas mentions particularly her kindliness and patience in dealing with the intimate problems of French children and their mothers, and her success in winning the confidence of people in every community where she served for the Bureau. "She was a liaison officer of the best type," he adds, "between the Children's Bureau and the people of the country we were trying to help."

While she was still in France she published, jointly with Dr. Ernest Gale Martin, professor of Physiology at Stanford University, a monograph on the strength of women, which begins with this statement:

> The World War has called women to tasks totally unsuited to the accepted standards of women's physical strength and capacities. At the present time, therefore, when our nation needs to mobilize every particle of woman as well as man power, it is well to determine with as much definiteness as possible what that power may be. In the case of women particularly, it is useful to know whether these unprecedented demands on her strength and activities are liable to make her racially less efficient and whether her handicaps are real or only traditional.

Dr. Martin and Dr. Mosher had tested and compared as to strength, a group of forty-five average, healthy college women (married and

unmarried) who had been physically active but not especially athletic, with 203 athletic college men. They found that in these two groups the strength of the weakest woman exceeded that of the weakest man by 320 pounds and finally concluded:

> There is no difference in the muscular strength of women and men which is due to sex as such. Such differences as are frequently found are brought about by the conventional limitations of activity or by dress. Marked overweight or underweight tends to lower the strength factor, as does also lack of coordination, which is too frequently found in women and exaggerated by their scant physical activity in childhood. The effects of muscular training persist long after the particular exercise has ceased. A high degree of muscular power in a woman in no way lessens her racial efficiency. Lack of muscular power, as in the pectoral muscles, may be a distinct racial disability.

After her return from war service Dr. Mosher carried on an investigation into the comparative height of women at successive periods. She showed that college women during the three decades from 1891 to 1920 had increased in size. The studies made at Stanford University of 4,170 students at the time of admission, show not only an increase in weight but also an increase of 1.2 inches in average height. These results were confirmed by Vassar College statistics based on the examinations of 7,064 women during 37 years, which showed an increase in height well over 1.5 inches, and also by Smith College measurements of 10,149 women during a period of twenty-two years.

Dr. Mosher attributed this increase in the size of girls to four factors: change in fashion of clothing, increased physical activity, development of physical training and sports in secondary schools, and change in the conventional attitude towards women's activities. As further explanation she wrote:

> One of the serious problems during the early days was to induce the delicate, undeveloped college girls to eat enough nourishing food. The girl of this first decade lacked appetite. The vigorous modern girl, physically fit, eats in season and out, and is as hard to satisfy as a growing boy — and for the same reason; the body is working normally and needs more food for growth and development.

In spite of her limited physical strength, and while always carrying on some kind of research in addition to her duties as Associate Professor of Hygiene, Dr. Mosher's omnivorous mind was never satisfied. She longed to travel but, except for a brief summer in Hawaii, she had no time until 1913 when she spent two months in Italy. It was, she declares, like the opening of closed doors, all her early interest in art suddenly revived and prepared her somewhat for the Continental atmosphere into which war work later precipitated her.

In 1922 she made a general European tour, renewing friendships she had made in England. There she saw many of the great personages in

public life and heard the debates on the Irish question. But as might have been expected she found herself more sympathetic than ever with French ideas and spent joyous days exploring old book shops in Paris to enrich her collection of the works of George Sand, whom she considers the greatest of all feminists. Of a possible 115 volumes she now has 90, added to the rich library inherited from her father.

In England she was by this time receiving the recognition which her work deserved and in 1924 she was one of the notable women attending the International Conference of Women Physicians. She had long desired to visit some Oriental country where she could make comparative studies of primitive women kept in seclusion, with English and American girls. With this objective, at sixty-one years of age, she set out for Persia; but an attack of influenza in Rome left her with a weak heart and prevented her from carrying out her intention. In the same year she had pneumonia in London, and these illnesses are mentioned here only because they were the first serious ones she had ever had. In spite of a delicate constitution and a spinal curvature she had earned her living for twenty-five years and had published a series of distinguished scientific monographs.

As a by-product, so to speak, she had invented and perfected, in collaboration with Professor E. P. Lesley of the Stanford Engineering Department, a new method of graphically recording posture and changes in the contour of the body. This schematograph, more rapid and accurate and far less expensive than previous methods, is now used by examiners of students in college gymnasiums and also by many physicians. Incidentally, during these years she published a modest, practical book, entitled *Personal Hygiene for Women,* which is now, expanded and revised, in the fifth edition and known widely in England as well as in America.

In 1928 Dr. Mosher was promoted to a full professorship at Stanford University and at this writing is retired from duty, though still living on the University campus. Although she declared her determination to spend her days in gardening she is still full of going projects. Her "War Sketches," a few of which have been published, are in various stages of incompletion; the sixth revision of her book is about to be made; and a mysterious research, the final one in her series on the efficiency of women, is going on. With her usual caution, Dr. Mosher does not even give it a name, but she is quite certain that it is as important as those already published.

As a physiological feminist, Dr. Mosher is convinced that the emancipated woman is not "an amateur male," to use Walter Lippman's phrase, and that being a woman is not a necessary disability. She would not have women mere imitators but urges them to make use of anything man may have found useful, while remembering to make of themselves more perfect women.

She established four major propositions: (1) that periodic disability in a woman, when no organic disease exists, is readily eliminated; (2) that healthy women breathe the same as men; (3) that there is no difference in the muscular strength of women and men as such; (4) that if work is adjusted to individual capacity without reference to sex, the potential power of woman may be used without danger of lessening her racial efficiency.

Feminine handicaps, Dr. Mosher declares, are reduced to the loss of time necessary for the bearing and rearing of children, and the modern woman with her sound body and clear thinking is reducing these to a minimum. The other traditional handicaps have been practically eliminated by modern science. It is interesting to notice that she is reiterating two statements with which she began forty years ago: women cannot hope to reach the highest places while so much time, thought, energy, and money are spent on clothes and fashion; and the attention of girls must not be too much diverted from their racial obligation, "no woman reaches her fullest development who is not a wife and mother."

With her strong and undeviating personality Dr. Mosher has, nevertheless, an amiable and maternal bearing. In her girlhood she had a lovely, fair complexion; brown visionary eyes, straight fine brown hair; clear-cut features and as now, a determined mouth. Her sincere, pleasant expression and directness of manner are altogther disarming.

When she began her studies in hygiene long ago, all girls wore cumbersome, fussy clothing, corsets, tight-fitting basques, and full skirts. Realizing the enormous cost in time and money of the prevailing type of dress, needing money to carry on her expensive researches, and as part of her effort to persuade girls to adopt simple, sensible garments, she devised a plain cloth costume which was a compromise between fashion and comfort. When the bicycle came into use and blouses and sport shoes began to be worn, she standardized her severe tailor-made dress, wearing it with a shirt-waist, starched collar and four-in-hand tie, and an untrimmed round hat—a costume which, with slight variations, she has continued to wear for thirty years.

Dr. Mosher's scientific achievements must not divert us from her extraordinary personal influence with girls. It is literally true that thousands of women bless her for their health and happiness. During her teaching years she was never too tired or too impatient to listen to the ailments and difficulties of her students. She was always inventing ways to develop their courage—to give them belief in the sources of strength within themselves. She set up in their minds ideals of strength and beauty that had never before been taught.

They were not sent to bed during the menstrual period but were given gentle, corrective exercises in a mat room of the gymnasium, or they looked at pictures of Greek statues of women, to develop an ideal

of physical perfection; or read clippings and articles on modern women's achievements and books on feminism. She was setting before them a picture of vigorous, lovely, courageous womanhood.

After they graduated, became engaged, married and had children, they were continually coming back to tell her gratefully what she had done for them; and they have ever since been sharing her teachings on efficiency with other women. We are apt to forget that women, thirty or forty years ago, were regarded as inevitably semi-invalids. Her gospel of physical fitness to prepare for wifehood and motherhood was something quite new in the education of girls. She was withal, their confidante—unshockable, kind, understanding. She wanted them to be happy, to fulfill themselves, to be perfectly competent women, not mere imitators of men.

One of her most sympathetic colleagues has said that Dr. Mosher "moves freely in the world of ideas but is somewhat inhibited in the world of reality." And it is certainly true that she shrinks from responsibility outside her own field. Self-sufficient, independent, original, executive, she has never worked easily under orders. When she was still a young assistant she went to President David Starr Jordan to discuss her resignation because she could not work under the head of the Physical Education Department. Dr. Jordan, comprehending her unique and inflexible character, said whimsically, "No doubt you are unhappy —I don't remember being comfortable myself until I got to the top!"

Although she has no close relatives, she has a strong sense of kinship to her cousins and an unusual loyalty to the few near friends whom she has made. In youth she felt keenly the discriminations of men against medical women, but she now appreciates the many kindnesses and the full recognition which she later received from the authorities of Stanford University.

Unquestionably her independence of character and her tailor-made appearance in a day of Victorian fashions caused her to be associated quite unjustly with militant feminism and perhaps delayed the recognition of her original contributions to physiological science in America. But recently her book and her work have been highly praised in England as well as accepted at home. She has always been hyper-fastidious, and somewhat suspicious of the motives of scientists who anticipated or used her materials. All her life she has been a procrastinator, to the exasperation of those who worked with her, and to her it is of no consequence how long any research may take. Doubtless this goes back to her love of precision and detail. All details are of almost equal importance in her mind and so cause her conclusions to be suspended until she is prepared to dispose of them, and no one but herself is permitted to evaluate them.

When Dr. Mosher retired from executive labor and teaching in 1928 she was all but exhausted. Never very strong and always over-

burdened, she has had to pause now and then to recover her energy; and at this time she dropped her research and spent most of her time perfecting a lovely Italian Garden, growing rare plants and semi-tropical fruits. But at this writing the sixth revision of her book on hygiene is begun and her studies of the mental abilities of women is in progress, which will complete the series begun so long ago. Meanwhile the used and unused materials of research accumulated during forty years are taking shape in the form of notebooks which will make available the vast quantity of her observations and experiments and the memoranda of related work by other writers.

The extraordinary variety of her interests and her placid way of ignoring the passage of years have caused her friends and colleagues to urge her to complete quickly the more important of her undertakings. Yet, looking back over this story, one sees that in her own way Dr. Mosher has already changed the lives of thousands of women by her researches; while her devotion to the ideal of women's physical freedom has emancipated them from weakness and from fear.

Written and approved
in 1937 by
MARY ROBERTS COOLIDGE
Approved also by
Clelia Duel Mosher.

NOTE: Dr. Mosher passed away at the Palo Alto Hospital on December 21st, 1940, shortly after I had had correspondence with her relative to her biography and that of her sister, Dr. Eliza. We are indebted to Mr. E. S. Erwin, the administrator of her estate, for the securing of these biographies. —AGNES R. WAYMAN.

Brief Outline of the Life and Work of Dr. Delphine Hanna

DELPHINE HANNA was born in Markeson, Wisconsin on December 2, 1854, the daughter of Juliet Chadwick and John Vacausan Hanna. Upon the death of her mother in 1864 she came east to live with relatives in New York state. She completed her public school education there, and, in 1874, graduated from the Brockport State Normal School at Brockport, New York.

For ten years Delphine Hanna was a teacher in the grade schools. She began teaching in the district schools of Monroe County, New York. In 1878 she went to teach in the public schools of Ottawa, Kansas. In 1880 she returned to the Fairport school in New York state. During this time she became more and more concerned with the physical needs and disabilities, with the lack of physical stamina, on the part of both the pupils and their teachers. She felt that she *must* do something, and she thought the best approach was through a study of the problem of physical training from a *scientific* viewpoint.

In direct response to her growing interest in the physical side of education, she enrolled for Dr. Dio Lewis' summer course in 1884. Dr. Lewis had just returned from a tour of Europe in which he tried to popularize physical training to the masses. Dr. Hanna felt that the field needed not only popularization, but a more scientific foundation. She was startled when she asked Dr. Lewis where she could find a school where physical education was taught from a scientific basis, for he said, "You don't need a scientific basis. People want to be humbugged."

At the end of that summer Miss Hanna returned to Fairport to resume her grade school teaching, but her interest and natural drive had been so roused that she stayed only ten weeks. She obtained a leave of absence to enroll in a two-year course at Dr. Sargent's Private Normal School of Physical Training at Cambridge, Massachusetts. The course exhilarated her. There were only twelve women in the course, and they held classes over a wagon shop. Dr. Sargent frequently completely forgot them. But when he *did* come he stayed overtime and gave them inspirational theories. Dr. Hanna admits that she never studied harder at anything. She struggled through anatomy and physiology textbooks without the aid of any materials to study, no bones, no skeletons, nothing. She used to go to the museum to study the lone skeleton there, housed in his glass case. But she learned a great deal. She passed her medical examination in physiology at the University of Michigan on what she learned that year. For she completed the two-year course in a year.

After completing her course with Dr. Sargent, Miss Hanna went to Boston, where she took lessons from Dr. Bradford in diagnosing and treating lateral spinal curvature. This was the foundation for her interest in orthopedic work, which she continued throughout her career, and which she made an important part of the curriculum at Oberlin College.

While in Boston she took work in the evenings at the Currie School of Expression. Professor Currie taught the Delsarte principles of poise and balance. These principles were emphasized in her early physical education courses. She spoke of them in an interview in December, 1936, "I learned rules of good posture in all positions which helped me so much thereafter in all my practical work and modified much of my program in physical education."

She was ready to begin her career, and she looked first for a position in a normal school. Her aim was to influence teachers, and through them to reach and help as many children as she could. Most normal schools lacked gymnasiums. One school thought Miss Hanna (then thirty-one years of age) was too old for the work! She was offered positions of importance in her old field of grade school teaching. A record of efficient teaching had kept that door open. But she *would* not turn back. She optimistically faced the meagre opportunities in her chosen field.

The task was not easy, as many pioneers could testify. It is one thing to supply people with what they want, but quite another thing to persuade them to take what they need.

A friend advised Miss Hanna to write to Oberlin College. This small Ohio college was already acclaimed as one which gave liberal education theories an opportunity. Oberlin sent their representative, Mrs. A. A. F. Johnston, Principal of the Women's Department, to tell Miss Hanna that they needed her, wanted her, but could not afford her. The two women met at the home of a mutual, and very interested friend, Miss Julia Dickinson. Miss Dickinson offered $300 for equipment, Miss Hanna agreed to go to Oberlin for expenses, and Mrs. Johnston accepted both contributions, with the assurance that their faith was not misplaced. In the fall of 1885 Delphine Hanna went to Oberlin.

The new instructor in physical training was given a room over the brick part of the Women's Gymnasium. She was the "counselor" for the eighteen girls who lived in that building. Along this line her duties were to see that no one talked or whispered after 7:30 and that every girl turned her lights out at 10:05. She describes her room quite vividly in a letter written to her Physical Education Alumnae (1929): "I surveyed my room; a black bedstead with husk mattress six inches too short; a wash stand with pitcher and bowl; two chairs, a stove and a rack for wood. I was told I could rent a bureau. I was finally given one without paying for it, as I was a teacher." The gymnasium itself was no better, as you will see: "I explored the gymnasium. It consisted of what is now the exercise room in the brick part of the building. It had

five dressing places, partitioned off from the north end of the room with dirty red curtains in front of them. On top was piled a camping outfit, which belonged to the Hatch boys. In one corner was a pile of oats; on the walls were various crude drawings. These I had removed and the room thoroughly cleaned." [1]

This was a good beginning for a year of hard, but productive work. Miss Hanna met every obstacle and overcame it to advantage. She met the extra expense of gymnasium suits (plus the necessary skirt) by putting a seamstress and machines in the gymnasium and making the suits on the spot. She spent Miss Dickerson's $300 on equipment for making physical examinations and for apparatus. The apparatus, like the gymnasium suits, was home-made and twice as useful as any that could have been secured elsewhere. The raw materials were ordered and "under my direction two colored carpenters made most of the apparatus. I felt quite proud when I overheard one of them say: 'She knows how to order things just as well as a man.' " [2] Some of the apparatus is in its original place and still in use.

Miss Hanna examined one-hundred and twenty-five women, and grouped them into classes for the year's program. Besides her regular classes she had a class of faculty women, one of grade school pupils, and one of college men. The faculty women were "on her side" when any question of decorum arose, and they helped persuade the president that there was no harm in the "fancy steps" that she taught the girls. In that early class of young men, whom she instructed so that they in turn could instruct classes of men students, were three men whose names have since become by-words in the field of physical education, Thomas D. Wood of Columbia University; Dr. Luther Halsey Gulick, one-time head of physical education in the New York City schools, a leader in the playground movement, and co-founder of the Campfire Girls; and Fred Eugene Leonard, former Head of the Department of Physical Education at Oberlin College.

Everything had gotten under way nicely, when tragedy struck. One night in January, 1886, fire destroyed Ladies Hall. The Women's Gymnasium was an annex to this building. The fire confined itself to the main structure, but well-meaning helpers chopped the apparatus loose from its new-found moorings, and scattered it around the countryside. Everything was hectic confusion. When it was finally determined that the gymnasium was not going to burn, all of the accoutrements from Ladies Hall were hastily carried in and piled everywhere. Dr. Hanna gives a good picture of the general melee: "The next morning I saw several funny things; among them a large dispan of hash with a pair of the cook's shoes placed carefully on top. A college boy who was helping during the fire said he had no idea there were so many bustles

[1] Letter to Physical Education Alumnae (1929)—Dr. Delphine Hanna.
[2] *Ibid.*

in existence." [3] Dr. Hanna rode all that day in a lumber wagon searching out and identifying pieces of her precious apparatus, which had been scattered about the countryside. After weeks of hard work in the bitter cold, the personal belongings of the girls were redistributed, the soot was partially removed from the building, and the apparatus was painfully replaced. "As the girls who had lived in Ladies Hall were scattered about town, we had to have more dressing rooms. We fitted up eight rooms over the gymnasium, each having in it a wood stove. As I had a man janitor, I had to keep the fires going after they were started in the morning. Another trial was the kerosene lamps. For bathing purposes tin wash basins were purchased to supplement the pitchers and bowls for baths. It was dreary enough outside; the gaunt walks of Ladies Hall were shored up to keep them from falling. Single planks led through the mud to College and Professor Streets. It was a hard first year." [4]

The picture she draws is a grim one. The physical education department was deplorably inadequate. But, although she was limited to a minimum of expense, by ingenuity and ceaseless energy she built up around her an efficient, well-balanced, well-equipped department. She placed her graduates all over the country, and was happy to find a growing demand for women to fill the same type of position that she had searched for in vain a few years before. She sent out young women with a purpose and drive comparable to her own. The statements of her former students testify to the fact that she was an inspirational teacher, with great managerial ability. She remained in Oberlin for thirty-five years. She found an exercise room, and left a well-recognized and thriving Department of Physical Education.

During these thirty-five years she worked to improve the course. She kept changing and broadening the curriculum. For a few years after she came to the campus she gave private lessons to train girls who wanted to be teachers of physical education. Her students were not listed in the college catalogue, and they received only a certificate from the college upon completion of their work. Dr. Hanna managed gradually to improve the course she offered her private students. By 1892 her students were listed in a separate division of the catalogue, the course was extended to two years, and courses from other professors were included. The certificate was changed and the course was definitely recognized as a "Normal Course in Physical Training." [5]

In all of her teacher-training courses, practice teaching in the local schools was emphasized by Dr. Hanna. It served a double purpose, that of training her girls and that of providing the community with physical education work in its public schools and churches. Dr. Hanna trained all her students in measurement and corrective procedures. A former major in the department, who is now a doctor in Canton, Ohio, eval-

[3] *Ibid.*
[4] *Ibid.*
[5] *Physical Education*, November 1892 (page 165).

uated Dr. Hanna's medical gymnastics course above similar orthopedic work that she received in medical school.

Dr. Hanna kept careful records of the physical examinations which she gave her students. Personal data for each girl was recorded and analyzed, and a prescription card worked out to correct the defects of weight, posture, and muscle development. Prescriptions were constantly altered to keep pace with the student's improvement. Dr. Hanna kept the records of all the students she examined, and by 1893 she had copied, tabulated, and classified the results of 1600 examinations into an anthropometric chart. She improved the technique of making the charts, and in 1895 a second chart was made. This one was based on the measurements of five hundred women, who had completed the prescribed fifty hours of exercise within an eight months period. These statistics were widely used in supplying other colleges with information for studies made in this field. She modernized and revised the chart again in 1915. These charts were one of Dr. Hanna's greatest contributions to the "scientific," that is the tests and measurements, side of physical education work. They have become popular everywhere, and are so well constructed now that you can know at a glance whether you are near, above, or below the average in measurements.

With the passage of years the entrance requirements for the women's training course in physical education continued to be more strict, and the course became more extended. Girls were becoming more interested in such a course, and the enrollment increased rapidly. Finally, after years of recommendations and refuted attempts, in 1900 a four-year course leading to a Bachelor of Arts degree was officially instituted. There has been much conflict of opinion as to whether this was the first normal course offering such a degree in the entire country. There can be no doubt that it was at least among the first. There is no doubt, too, that it was so because of the tireless planning and effort on the part of the director, herself.

Dr. Hanna's goal was recognition of and demand for scientific physical education, and while she worked to improve the status of her own department, she worked, also, to improve her own professional standing.

In the summer of 1887 she attended summer sessions at Harvard. She took entrance exams for credit and completed the medical course at the University of Michigan in two years. She received her M.D. degree in 1890. In the summer of 1893 she enrolled in the Baron Posse Training Course given by the Swedish director in conjunction with the World's Fair. In 1896 she took a leave of absence for rest and recuperation at Colorado Springs. But she could not be idle. She registered for psychology courses in the college there, did some teaching in the gymnasium, and even organized and directed two popular basketball teams. In the fall of 1898 she entered Cornell University and completed her study to earn a Bachelor of Arts degree in 1901. In that same year

Oberlin bestowed a Master of Arts degree on her in recognition of her extensive work on and publication of the anthropometric charts.

In recognition of her advances in educational preparation and her fine work in the department, Oberlin College also advanced her rank on the staff. From 1885 to 1887 she had been Instructor in Physical Culture. From 1887 to 1903 her official title was Director of Physical Training, Women's Department. In 1903 a full professorship was awarded her. She thus became the first woman to be a full professor of Physical Education. From 1903 to 1920 she was Director, Women's Gymnasium; Professor, Physical Education. Upon her retirement in 1920 she became the first woman to receive a Carnegie pension in physical education. She is now Emeritus Professor of Physical Education.

In explanation of her constant desire to further her education and training Dr. Hanna said in an interview on December 31, 1936. "During all these early years it was my aim to secure a better standing with the faculty so that my successor and my profession might enter upon an established plane of recognition with other leaders and their departments."[1] It is hardly necessary to say that in this she was completely successful.

While Dr. Hanna spent a good deal of time and effort in advancing her standing, she did not neglect the department itself. Her absences were spread out over a period of years, and each time she secured a competent woman to take over the directorship during her absence. The program of the gymnasium was extended to include every student in the college. She stressed outdoor work—especially bicycling and hiking for recreational activity. Bicycling caught on and has become a tradition at Oberlin. Now there are rows of bike stands before every class building and dormitory. In January, 1904, Dr. Hanna organized what she called the Women's Gymnasium and Field Association. It was an organization by which she hoped to touch the life of every college girl. She thought that each one of them should become proficient in some sport that she could carry over into her life after college. Such sports as tennis, dancing, skating, hiking, bicycling, and swimming were emphasized. This carry-over theory has in recent years become definitely recognized. The Gymnasium and Field Association was the forerunner of the present Women's Athletic Association which carries on by a more varied program the ideals set down by Dr. Hanna.

Dr. Hanna maintained contact with the national aspects of her profession by her interest in the national organizations. She was a charter member of the Ohio Physical Education Association and the National Association of Directors of Physical Education for College Women. She was an active member, too, of the American Physical Education Association, the American Anthropometric Association, and the Cornellian Council of Cornell University. In 1925 Dr. Hanna was

selected for membership in the Michigan Hall of Fame at the University of Michigan. In 1931 Dr. Hanna was honored by her profession when she received the Honor Award of the National Fellowship at a district meeting of the American Physical Education Association at Trenton, New Jersey.

In 1920, at the end of her thirty-fifth year of service to the college, Dr. Hanna retired from active service. She became a Professor Emeritus and her name was added to the not very long list of men and women who had served the College for twenty-five years or more. She left the department in the hands of Dr. Helen Finney Cochran, with whom she had been working for some time. Dr. Cochran's career was cut short by her sudden death in 1923. The position of head of the department which Dr. Hanna had raised to such a high standard, was inherited by one of her own girls, Dr. Gertrude Evelyn Moulton. Dr. Moulton has carried on Dr. Hanna's ideals and traditions in the department. Through her efforts some of Dr. Hanna's dreams have recently been realized. The Crane Swimming Pool (1932), the Galpin Athletic Field for Women, and the beautiful, spacious new Hales Memorial Gymnasium (1938) were all projects visualized by Dr. Hanna and recommended as greatly needed in her annual reports.

Delphine Hanna immediately served Oberlin College for thirty-five years. Her work and record are associated with the pioneering history of the College in the general field of higher education. She entered the profession in 1885, she achieved professorial rank, she trained and placed many of the first organizers and directors of college, public school, and association departments. She was a pioneer in deed, in thought, in vision for the future. Through her writings and professional example, but mostly through the girls that she sent out well prepared to teach their subject, she gave impetus to the whole physical education movement in the United States.

Compiled by a Secretary in the office of DR. GERTRUDE MOULTON — *from information taken from a thesis of one of the graduates of Oberlin College.*

Compiled November 28, 1940

* * *

Dr. Hannah died April 16, 1941.

Thirty Years After

A Student's Appreciation

I AM deeply grateful for this opportunity of paying high tribute to the memory of Marien Foye Carter, and I feel that I am expressing the sentiments of all her students, for she was truly their guide, philosopher, and friend, not only during their college days but for as long as she lived. She possessed in abundance all of the qualities of a great lady and a master teacher. Of her it can be truly said:

> The light in her eye, that was love I know,
> There was ne'er any self in her smile;
> There was power to bless in her slightest caress
> That could make even suffering worthwhile.

Miss Carter was a life-long student, who spared no effort to learn all that was possible about her work and its relationships. She was eager to bring all current material to her students without losing the importance of basic principles. Her ability to analyze and correlate was truly uncanny, and her method of presentation so clear and simple that any student gained with the knowledge a sense of security and competency. I believe that we learned as much from the Dean's manner as we did from the actual material presented in theory and practice. She was a model of simplicity and benign in her consideration of the student's personality. Her manner in the classroom and in the gymnasium was what is written about and seldom seen. She reflected her work, without ostentation, in voice, posture, and movement. Her verbal descriptions equalled the elegance with which she demonstrated her practical teachings. From this, it can be judged she was an inspirational teacher in the best sense of the word, because she never traded on her personality by substituting manner for materials. She was analytical and thorough, without boring. She was quite witty, too, in her quiet New England way, and punctuated her lectures from time to time with amusing original stories that had direct application to the subject in hand.

As a disciplinarian, Dean Carter was one who needed neither method nor harshness, because the pitch of her life, her ideals, and self-control were so spiritualized and her professional sincerity so great that even the irrepressibles were too impressed and admiring to disturb the gentle dignity of the atmosphere she always created. Interest, order, method, and gentleness were constantly a part of her presence. Therefore, discipline was seldom necessary, but when it had to be called into play, it was used so aptly that even the most uncouth learned by it without being permanently hurt.

I am sure that I speak the profound gratitude of all her students

when I say that Providence was bountiful and full of consideration for us and our profession in allowing Marien Carter to write her message in our minds and our hearts.

TUCKER JONES—1909
Savage School for Physical Education

MARIEN FOYE CARTER

Born at Lancaster, Mass., February 2, 1854.

Father, Granville Carter, of Portland, Maine.

Mother, Martha A. Wilder, Lancaster, Maine.

Early education in private schools of Lancaster and Boston.

Later moved to Brooklyn, N.Y.C., where Mr. Carter entered the Custom House brokerage business.

While living in Brooklyn Miss Carter became interested in physical education work and entered the Brooklyn Normal School of Physical Education from which she was graduated in 1887, following which she conducted classes in physical education at the St. Peter's Episcopal Church in Brooklyn, under the pastorate of Dr. Lindsey Parker. She numbered among her pupils such celebrities as Lillian Russell, Margaret Illington, Maude Adams, the family of John Drew and others.

Was appointed chief instructor of the Dr. Savage Physical Development Institute in 1890, and, when Dr. Watson L. Savage organized the New York Normal School of Physical Education, she was designated as Dean of the institution, in 1898. Graduate of the Harvard University Summer School in 1891.

Graduate of the Gilbert Summer School.

Graduate of the New Haven Normal School of Gymnastics, 1892.

Dean, Chautauqua School of Physical Education, 1905.

Practitioner of Therapeutic gymnastics in New York City.

Vice-President, New York Society for Medico-Gymnastics and Massage. Instructor in dancing and artistic gymnastics at Yale, Harvard, and Chautauqua Summer Schools and at Mount Holyoke College and Clark University.

Later decided to devote all of her energies to the teaching of dancing and methods of teaching at the New York Normal School of Physical Education (now the Savage School for Physical Education), and to her administrative duties as Dean of this institution. She continued in this capacity until her death on January 26, 1929.

She was a member of the National Physical Education Association and the New York Physical Education Society; the Anderson Club, The American Women's Association, and many other organizations interested in the advancement of the cause of physical education.

Harriet Isabel Ballintine – Pioneer Veteran

"ENGROSSED in the demands of the present day problems in physical education one sometimes fails to realize that the tremendous expansion in the field of physical education has been encompassed in such a space of time that there exists today a group of people who may rightfully be designated as pioneer-veterans. Of those who blazed the trail for women, Harriet Isabel Ballintine of Vassar College is an outstanding figure. Trail blazing in physical education for women involved not only the formation of programs for and adaptation of various activities to the needs of women, but the more subtle encounters with social tradition and mental attitudes which needed remolding to allow the freedom necessary for wholesome development."[1]

Harriet Isabel Ballintine, Department of Physical Education at Vassar College, 1891-1929.

Born near Rochester, N.Y., in 1864.

Graduated at Ingham University, Le Roy, N.Y., 1888.

Attended Miss Marie Pond's private gymnasium for women (one of the first in the country) in Rochester, N.Y., 1888.

Attended Harvard Summer School, 1889.

Graduated from Dr. Sargent's School of Physical Training, 1891.

Assisted in gymnasium at Lasell Seminary and Bennet St. Settlement House, Boston, Mass., 1891.

Instructor Harvard Summer School and five weeks Clinical work at Children's Hospital, Boston, Mass., 1896.

Instructor at Harvard Summer School. Received certificate 1902.

Attended Miss Faulharber's School of Classic Dancing; received diploma 1912. Also attended Chalif's School of Classic Dancing.

Appointed "Director of Gymnasium," Vassar College, 1891.

Assistant Professor of Physical Training, Vassar College, 1913.

Associate Professor of Physical Education, Vassar College, 1919.

Retired 1929.

Miss Ballintine became interested in physical education through her sister, Dr. E. P. Ballintine, who was attracted by the writings of Dr. Dudley A. Sargent on physical education for women.

A pupil of Dr. Sargent's, Miss Marie Pond, had just opened a private gymnasium for women in Rochester, N.Y. Here Harriet Ballintine received her first training. In the fall of 1890 she enrolled as a pupil in Dr. Sargent's own school for physical training in Cambridge. At that time the enrollment did not exceed a dozen students.

[1] From an article by Miss Alice Belding in *Sportswoman*, April, 1929.

In the fall of 1891, Miss Ballintine was appointed "Director of the Gymnasium" at Vassar College. At that time the gymnasium was reported to be the largest and best equipped gymnasium for women in the country.

It is with difficulty that one can get Miss Ballintine, who is by nature extremely modest and self-effacing, to accept any credit for accomplishment. Yet a glance at the history of physical education at Vassar shows that her vision and leadership made possible the introduction of the sports and physical activities which are now so universally accepted but which in the early days were innovations, even daring experiments which were allowed under very definite restrictions. Miss Ballintine was enrolled in the first class of Athletics for Women which was taught by Mr. James Lathrop, a Harvard Athletic trainer, in the Harvard Summer School in 1896. At Vassar was held the first track and field meet for women.

In 1894 Mr. Melvin Gilbert introduced the "Aesthetic Dance." Miss Ballintine immediately enrolled in the class and in 1898 aesthetic dancing, now known under such names as natural, classic, interpretative, and modern, was established at Vassar.

Basketball, tennis, ice hockey, and golf were all included in the early physical education program.

Student leadership, student coaching, which is so much emphasized now, was early advocated and used by Miss Ballintine in sports work.

Keeping in touch constantly with the new forms of activities for women through attendance at the Harvard Summer School as both teacher and pupil, Miss Ballintine met Miss Constance Applebee. Impressed with the English game of field hockey, she was instrumental in bringing Miss Applebee to Vassar in 1901 to initiate the students into this game, which soon became popular in other colleges.

"College games were not easy to start in these days because many schools required only the barest amount of mild exercise—walking for the most part. But when Vassar and other colleges took this forward movement, the preparatory schools were practically compelled to be as up to date in sports as they were in academic matters. By proving what sports could do for health, the colleges were in a position to demand that schools send them girls in similarly good physical condition. The result was their rightful place as equals in importance to academic examinations for admission."[2]

Miss Ballintine by no means spent all her energies in promoting sports and athletics for young women. The future possibilities of the department and its place in the college were always uppermost in her mind. She waited for the psychological moment to make requests and recommendations — which in time were usually granted.

Looking back over the years associated with Miss Ballintine, I find

[2] *Ibid.*

a number of changes due to her foresightedness and effort worthy of mention.

The department has changed its name from "Gymnasium" to Physical Training, and Physical Education, putting emphasis on Education rather than exercise.

In 1925, thinking of retiring, Miss Ballintine went a step further and recommended to the Trustees, "that the department be reorganized on a chairmanship basis; that the title Director of Physical Education be discontinued; and her successor be appointed chairman and that she be made a full professor." The request was granted and now the department is on the same basis as other departments in the College.

Although the gymnasium seemed adequate in 1891 it became necessary to have more space, and in 1907 a section was added — and soon the agitation for a new building. Miss Ballintine worked on plans for several years. The outcome, Kenyon Hall—our present building with facilities for sports, a better swimming pool, etc.—was erected in 1933. Although the building was not finished in Miss Ballintine's regime she certainly sowed the seed.

I am impressed with the progress and recognition the department has gained in the College, with the foresight and soundness with which Miss Ballintine built her foundation to accommodate any growth and expansion in the future.

May we who follow not forget the pioneers who blazed the trail, and made possible the privileges we enjoy; and above all be constructive, not destructive in our changes. Keeping abreast with the times with one thought in mind; the rightful position the Department of Physical Education should take in College Education.

M. L. KING, *Vassar College*

Senda Berenson

Director of Physical Education at Smith College, 1892-1911

FIFTY years ago this fall Smith College was rejoicing in the opening of its new gymnasium—the Alumnae Gymnasium built at the cost of some $30,000, of which the alumnae under the leadership of Elizabeth Lawrence '93 (Mrs. Samuel Clarke) had raised $23,000. At that time it was one of the largest and best equipped of any of the gymnasia for women. It even boasted a swimming pool, in which "not more than five nor less than two" could disport themselves at any one time. Often half affectionately referred to as the "swimming bath," it valiantly played its part for a quarter century until the Scott Gymnasium pool ran it dry forever.

Not that the opening of the gymnasium in '91 marked the introduction of physical education at Smith. Far from it. The earliest *Catalogs* stipulated: "Regular gymnastic exercises in the gymnasium will be prescribed under the direction of an educated lady teacher." To be sure, the "gymnasium" from '75 to '79 was simply one end of the vast Social Hall, but there, and later in the first separate gymnasium—a modest wooden structure now used as the college carpenter shop—four one-half hour periods of gymnastics a week were required of the two lowest classes, and, with the exception of four years in the middle 80's when gymnastic teaching was combined with elocution, there has always been a full-time "lady teacher." The succession of ladies up to '91 were pupils of Dio Lewis, and replicas of earnest students in their twilled flannel with long drawers, their ankle length skirts and high collars have performed to slow music with dumbbells and Indian clubs, wands and chest weights for hilarious audiences of Sophia Smith's daughters of many a crooked and perverse generation of these later times.

To go back to 1891. With the opening of the Alumnae Gymnasium it was felt that a new era in gymnastics was beginning. Just how new no one dreamed, for no one sensed the fact that something dynamic happened not only to Smith but to the whole status of physical education for women in this country at the moment Elizabeth Lawrence—commissioned by President Seelye to find another "lady teacher"—persuaded Miss Amy Homans to persuade a charming small person of twenty-four, one Senda Berenson, to interrupt her second year at the Boston Normal School of Gymnastics to "fill in" at Smith in January, 1892. Between her coming and her resignation after her marriage in the summer of 1911 to Mr. Herbert Vaughn Abbott, a beloved professor of English, the worth-whileness of a physical education program in

women's colleges was established beyond the shadow of a doubt; physical education was made an important and reputable part of the teaching service, and its teachers were accepted members of college faculties.

Happily something of the story of those years in which the pioneers were "opening the closed doors of ignorance and overcoming constant opposition" has come from "Miss Berenson" herself, and if she reads this sketch and is embarrassed to find her simple tale embellished with data she never suspected were being gathered from her students and colleagues, it will be only because during her whole career she was so busy demonstrating the faith that was in her that what people thought of her personally didn't interest her very much.

The phrase, "the faith that was in her" has a special significance when applied to Senda Berenson because if ever a person went into teaching as a missionary it was she. And she had good reason. She was a frail girl of seven when in 1875 her mother with the children came from the province of Vilna, in Lithuania, to join the father in Boston the year after he had come to America. (Bernard Berenson, internationally known art critic, was one of the children.) Ambitious to go to college, she went from the elementary schools to the Boston Latin School but was never strong enough to complete a year. She tried the Boston Conservatory of Music but was unable to practice because of her aching back. And then Providence entered the picture. There was a new school in town, the Boston School of Gymnastics, the first gymnastic school in the country to use the Swedish System and to stress the value of health in all its activities, and an enthusiastic friend at last persuaded the protesting but desperate Senda, who "hated all forms of exercise," to enter the school in the fall of '90. She tells the story of her experience:

"How I hated that school for the first few months! Disliking all sciences, I studied anatomy, physiology, and so forth. Gymnastic work did not interest me and the simplest exercises made me ache all over. I heard that my case was quoted for years by Dr. Enebuska as encouragement of students who were not strong. But I persevered. As everyone knows, Swedish Gymnastics begin with simple fundamental work, progressing with combinations of these and more complicated exercises. After five minutes of standing erect I had to lie flat on three stools. After three months, however, I began to feel that I was better and at the end of the year was doing all the gymnastics required. The second year Miss Homans sent me twice a week to Andover where I taught the theory and practice of gymnastics to a class of teachers from the primary grades to the headmaster. . . . It is impossible to tell how my life had altered. I had changed an aching body to a free and strong mechanism, ready and eager for whatever might come. My indifference had changed to deep conviction and I wanted to work only in physical education so that I might help others as I had been helped."

And so she came to Smith. She was so shy that she made Miss Lawrence promise to stay with her for the first month until she got her classes organized and the executive work under way — indeed she says that she never would have attempted the job without Miss Lawrence's friendly aid. At the end of the month classes *were* organized; not the least of the difficulties of those days was the fact that faculties in general so completely ignored physical education that daytime hours were filled with classes in cultural subjects and "gym work" had to wait until the late afternoon and evening hours. Miss Berenson was the only instructor for that first year and there were some four hundred freshmen and sophomores. More formidable than their numbers, however, was their abysmal and blissful ignorance of the real value of physical education. Many a girl got an excuse from required work from a doctor as ignorant as she, and juniors and seniors scarcely exercised at all. A few were fond of tennis and croquet, a few walked, and baseball of a sort was an after-supper fad. It was played, of course, in long dresses and on one occasion at least the pitcher wore a ruffled white muslin with a train for good measure. Most formidable obstacle of all, however, was the same ignorance, just as abysmal but not so blissful, of the parents of the students and of the faculty whose cooperation she had to win and who quite honestly believed either that physical exercise was injurious to the delicate mechanism of the female body or that gymnastics should not be taught in a college. Even the administration, although believing theoretically that some sort of exercise was good, was timid about introducing anything new. Small wonder that she felt that nine-tenths of her time was spent in "moral suasion"! "It was like punching a pillow—if you made a dent in one place a bulge came out in another." Truly, the first hundred years are the hardest, and the pioneers of the early nineties jumped hurdles that the modern teachers of physical education do not know of, but which they should recognize with deep gratitude.

With few exceptions, none of the students had had training in preparatory school, and so over and over again Miss Berenson stressed the importance of drill in elementary exercises and the necessity of working up to the more complicated and interesting work step by step. "Because of the excellent training I had had," she says, "and even more because of my own experience, my great enthusiasm centered on the idea of helping the largest number of students possible on the road to health. I wanted not only to make the weak girls strong but to keep the strong girls strong." Physical education took on a new meaning in her eyes, a meaning which has developed through the years— it was a preventive measure as well as a curative agency. She goes on, "As my own ambitions had been thwarted because of lack of health I was eager to encourage the girls to develop and maintain a fine mechanism which would aid them in their intellectual work and enrich their whole lives."

Uphill work—but here a little, there a little, she made progress. Physical examinations were introduced, which meant that the wind was tempered to the shorn lamb and there was an incentive for a girl in "corrective gym" to do her best in order that she might fit herself for one of the "strong gym" classes. Even in apparatus work posture was stressed as a foundation for physical health, and always Miss Berenson worked for perfection and precision of muscular coordination. "That little figure calling directions in that soft yet staccato foreign voice fascinated and compelled us," one of her students testifies after more than forty years.

The next year there was another teacher to help and elective classes were tentatively but hopefully offered to juniors and seniors. A surprising number elected them and there was a Demonstration Day at the end of the winter. Seeing is believing, thought Miss Berenson, and she successfully refuted the doubting Thomases who had said that Swedish Gymnastics made girls angular and ungainly. And before anyone could wink, aesthetic dancing had a following — a far cry, perhaps, from the lovely rhythmic dancing of today, but a beginning. Still with the juniors and seniors in mind a system of exercise cards was worked out, and if in some instances exercise-by-the-hour was conducted at W.P.A. speed, so to speak, doubtless in the great majority of girls good habits were encouraged.

And then a really black cloud arose on the young teacher's horizon. Firm in her belief that in order to develop an enduring interest in and respect for her department it was vital to make it as important in the life of the college as the academic departments, she was aghast to learn that the requirement for physical education for the sophomore year was to be dropped. The faculty thought that college women were "old enough to know for themselves what was good for their health"—Heaven save the mark! There is drama in what followed. Shy, Senda Berenson may have been, but her backbone was stiff with a stiffness not produced by any Swedish gymnastics. She got permission to address the august faculty — she had never ventured to a meeting before, perhaps she had not been invited! — and with no committee whatever to back her up, she pled her cause alone. Only one member seemed to be definitely on her side, she says, but when the vote was taken, the sophomore requirement still stood firm. Later on she went to faculty meetings regularly and she marched in processions with the full professors although she had no title.

In the spring of her first year Miss Berenson chanced to read in a magazine published by the Y.M.C.A. Training School in Springfield, about a new game called basketball, invented as a class exercise for boys by one James M. Naismith. Presto! If for boys, why not for girls, and almost overnight a great tradition was started at Smith College. More than that, by Miss Berenson's instant appreciation of

the possibilities of the game she gave tremendous impetus and direction to sports programs for women everywhere. Played first as a class exercise, in about a month teams were chosen (nine on a side instead of five because the floor was so large) and the first game was played between classes of '95 and '96. Nothing like it had ever happened before—or since! Miss Berenson's own account is too vivid to miss:

"We thought that just a few students would come to watch but the whole college with class colors and banners turned out. They filled the broad balcony, the early ones sitting on the edge dangling their legs. They stood along the walls. As I threw the ball for the beginning of the game, it struck the uplifted hand of the center player, the captain of the freshman team, in a peculiar way so that it put her shoulder joint out of place — a joint dislocated easily but of which she had forgotten to tell us when she had her physical examination. The onlookers, already excited became more so. We took the girl into the office and pulled the joint into place, another center took her place and the game went on. Except for the fact that we had nine on a side, we played the men's rules. The cheering and screaming of the spectators was a high-pitched sound I do believe no one had ever heard before and was deafening. The next day the local paper appeared with flaming headlines: The Gladiators Appear, One Dying. There was a wild-eyed line-drawing of said gladiators, and a lurid description that must have made the staid citizens of the Valley wonder whether Sophia Smith had been wise to found a college in which young women might receive an education equal to that accorded to young men!"

They need not have worried. "Equal" did not mean "the same" to Senda Berenson, and although a whole new vista in the realm of physical education had been opened, she sensed the danger. It must be remembered that up to this time women had never played anything that required teamwork; their sense of good sportsmanship and fair play, of working for the team as a whole instead of for themselves individually had not been developed. Miss Berenson called her teams together, she explained that imitation of their brothers was definitely taboo, and that although she considered basketball a fine game she would consent to its continuance only on condition that rules be modified to make it safer for women. The girls agreed, and then and there the rules were made more acceptable. The chief changes made at this time were (1) dividing the floor into three equal parts and confining the players to their own fields, and (2) forbidding the snatching of the ball from another player's hands. These two rules necessitated others, and minor changes were made from year to year as experience dictated.

Basketball swept the country. Soon there came challenges, couched in belligerent terms, from all over the East and West, and at this point Miss Berenson again proved herself a leader. With a long look ahead

she foresaw that intercollegiate athletics might well become a menace to real physical education for women, she answered each letter politely, but firmly explained her reasons for refusing all offers. By this stand, steadfastly adhered to, she dissipated the fear which had been at the bottom of much faculty hostility to her department. By this time modified rules began to appear. It was apparent that uniform rules for women would not only make the game itself more important but would encourage the right spirit in playing games. Senda Berenson was asked to draw up a set of rules and to prepare a pamphlet on basketball for women which would include articles on playing the game and, even more necessary and significant, articles on good sportsmanship. As she remembers it, the request came from Mr. Sullivan of Spalding's Athletic Library which published the men's rules. This pamphlet, published in 1901, was the first Basketball Guide and Miss Berenson continued to edit the rules until the 1916-17 issue, five years after her marriage. In 1905 the permanent Basketball Committee for Women was organized with Miss Berenson as chairman from that date until 1917. It goes without saying that when the National Section on Women's Athletics of the A.A.H.P.E.R. met in April 1941, the name of Senda Berenson Abbott ranked high on the list of those its members had invited as honored guests.

She tells an amusing tale of the years immediately following the adoption of the women's rules. It seems that Dr. Luther Gulick, head of the Springfield Y.M.C.A. Training School when Mr. Naismith was there, came to see a practice game at Smith. "I thought the girls played with speed, accuracy, and joy," she says, "but when I asked him he said, 'Well, that is a fine game, but why do you call it basketball? Why not tiddly-winks?' I was made happy when a few years later he had changed his mind and wrote an article for the pamphlet in praise of our rules."

And she did develop the spirit of good sportsmanship. One after another belonging to the long succession of teams trained by her, say something like this: "Her decisions were sharp, but we never thought of questioning them because we knew she was so fair." "She never lowered any standard because some people thought that 'girls couldn't take it!'; she knew better and made us know it too." She awakened a "liking for all games because they made us keen," and perhaps best of all, "She never played favorites, and her professional integrity was an example for us all." High praise for any teacher in any field.

So much for the instructor; for the woman herself, one of her old girls says, "A bit temperamental, of course, but we adored her. In my memory remains vividly today her personality so redolent of charm that it bowled us over. She even looked cute in the gym suit of that day, dark blue bloomers, long black stockings — what more could be said?"

There is, as a matter of fact, much more to be said, for Miss Berenson's enthusiasm and ambition to bring physical education at Smith to its highest effectiveness drove her forever forward, and with every year new plans for helping individual girls and new plans for competitive sports were put to work. In 1893 we first hear of an athletic association and in '94 the association, open to all members of the college under the Department of Physical Culture was recognized officially. A boathouse was talked of, fencing was becoming popular. It was all encouraging, but far from being satisfied with her achievements, Miss Berenson felt that she herself needed fresh inspiration. So in the spring of 1897 she sailed for four months' work under Dr. Törngren at the Central Institute in Stockholm. Graduate work in physical education at a foreign university was not commonly undertaken by a young woman in the nineties. It was balm to her soul to see how unaffectedly the Swedish people, men and women alike, believed in her kind of work as fundamental for everyone. Among other things she studied fencing under one of the fencing masters of Swedish army officers.

Back at the college in the fall, her department and some Northampton citizens cooperated in making a very good nine-hole golf course on the outskirts of town — a valuable contribution to any college, this ability to bring town and gown together. Volleyball, archery, tennis, baseball, and later cricket set more and more girls to exercising painlessly (!) and then one red-letter day in 1901 Miss Applebee came to teach hockey. No need to stress the importance of that event to sponsors of women's athletics! Five hundred Smith girls in long skirts and high-neck shirt waists literally fell at her feet.

There was a nice sense of balance in Senda Berenson's conception of the program of work in physical education. Sports were valuable, they taught good sportsmanship and the joy of competition, they entertained onlookers, but Swedish Gymnastics were fundamental, and in March 1900 on Demonstration Day a silver cup, donated by her early friend Elizabeth Lawrence Clarke, was awarded to the class scoring the greatest number of points in floor work, marching, running, and apparatus work. The type of work has changed since that day but, after 41 years, cups are still awarded amid enthusiastic cheers at a March Demonstration Day.

In 1905 a rich gift came to the department — money with which to purchase an athletic field. Named for its donor, Mr. Frederick Allen, the first Field Day celebrated the completion of Allen Field in the spring of 1908. Those nine acres were hailed with joy by the students but with thanksgiving by Senda Berenson, for they meant more room for more activities to interest more girls in healthful exercise. Even the least athletic came into their own when the ladylike game of croquet turned the scales for a certain class in that first field day. Field Day was an experiment for there were many who thought

the girls would not be interested, many who said that there should be track athletics — and those Miss Berenson would not have. She never wanted to develop the "athletic type" of young woman but always stressed exercise for health and education. And once again the doubting Thomases admitted they were wrong for Field Day — competition in games — scored a huge success.

With the same missionary spirit which had started her on her career, Miss Berenson held special consultation hours for the under-average girl at college, she taught the theory and practice of gymnastics to men and women at Chautauqua, and, most significant of all, she taught twice a week for six months at the Northampton State Hospital. That was pioneer work of a special kind, for although today the use of scientific physical exercise as a therapeutic measure for treating mental cases is universal, it was almost unknown in that day. So successful was she in certain stubborn cases, so skillful and understanding in winning their cooperation, that the trustees of the hospital begged her to devote herself to that work. She was strongly tempted but decided against it. The trustees were so impressed with her results, however, that they built a gymnasium for the women patients that same summer.

And then came 1911 and Miss Berenson's marriage to Mr. Abbott of the English Department. There were five teachers in the Physical Education Department then. The fine system of awards, which is so satisfactory a way of recognizing good sportsmanship, had been established. Work was flourishing. But Mrs. Abbott felt that a full-time job was more than a faculty wife should undertake. She resigned; but too keenly imbued with the importance of physical education to drop teaching altogether she headed the department at Burnham School for ten years.

Thirty years have passed since she officially left the college, but there is scarcely a feature of the physical education programs of today either at Smith or at many other colleges which cannot be traced back to some precedent set by her. Happily she is much in Northampton, vital, direct, charming as in her teaching days, and Dorothy Ainsworth and her staff listen to her gladly. They count on having her as an honored guest when in 1943 the Athletic Association celebrates the Fiftieth Anniversary of its inception. And when students, alumnae, and friends of the college pass down Berenson Place, the broad approach to Scott Gymnasium which is the heart of the Physical Education Department, they will be reminded that the Place is fittingly so named for truly it was Senda Berenson and no other who led the way.

Contributed by EDITH NAOMI HILL
An Editor of the Smith College Alumnae Quarterly

Pioneering in Physical Training – An Autobiography

JESSIE H. BANCROFT

ITS possibilities, rather than its immediate opportunities, doubtless drew me to physical training as a profession, for my ancestors were always pushing on to new developments from the time they arrived in Massachusetts from England soon after the Mayflower. My father and grandfather Bancroft, like the Hubbell's on my mother's side, were born in New York State, where much of their lives were spent; but the west fascinated them and they were active in the development of transportation to that alluring region. Grandfather Bancroft built, owned, and operated the first steamship line on Lake Michigan from Port Huron to Milwaukee, and was in the Michigan State Legislature. Some years later my father was Superintendent of the Syracuse Northern Railway, now a part of the New York Central, and left that to help an uncle, who resigned as Assistant Postmaster General to put through the Grand Trunk Railway. Prospecting through the western states before the Civil War, my father saw the John Brown riots in Kansas, and slaves sold on the auction block in the public markets of St. Louis before he settled in Winona, Minnesota. He met and married my mother in that lovely town on the Mississippi, and I was born there in 1867; but soon father was back in New York in railway interests.

Officials in those days had passes for themselves and families, and we made many trips back to Minnesota and other places, finally moving for a time to the middle west, where my 'teens were spent. The adolescent years were a period of invalidism for me, and it was for my own health that I first became interested in physical training. The subject seemed then not to have grown since the Dio Lewis days of which our grandmothers told. There was no public interest in it, no demand for it. The few teachers of the subject had to create a demand before there was opportunity to teach. It was not a recognized part of school curricula nor were there any normal schools or courses in the subject. Occasionally waves of interest in exercise would sweep the country. My own first experience with systematic exercise was in the early 1880's, when Mrs. Jenness-Miller of New York attracted much attention as a dress-reformer, though exercise, diet, and other points of personal hygiene were equally important with sensible dress in the lecture and parlor classes that she and her assistants conducted through the country. The exercises taught were admirable as hygiene, many of them recumbent, and all emphasizing good carriage or posture. I joined one of these classes, and being much interested in the subject took private lessons also, to learn the teacher's viewpoint.

Some few years after this course, probably about 1888, the press told of a large Summer School of Physical Education which Dr. Sargent had conducted at Harvard University, and of the organization of an American Physical Education Association of which he was one of the founders. I wrote to him about both, asked his opinion of physical training as a future profession for women, and if there were opportunities for such training in the middle west. He sent an excellent reply, told me of his belief in the subject, and of graduates of his normal school, the Misses Marsh, who had opened a school and gymnasium in Minneapolis, where I could make a beginning in normal training. I went to them for a season, studied the anatomy, physiology, and therapeutics of exercise, had an introduction to the Swedish and German systems of gymnastics, and a first experience in commanding classes on the gymnasium floor.

Following this I took a normal course in kindergartening (1889-two years in one), at the Winona State Normal School, now the Winona Normal College, undecided which subject I wanted to teach. While taking this kindergarten course I had opportunity outside the school to learn another of the systems of exercise which swept the country, the Delsarte system. The exercises were sometimes classed with the "greenery-yallery" aestheticism of the Oscar Wilde craze, but they had a sound artistic aim, were based on a knowledge of anatomy, and laws of grace in movement. No exercises have more directly and effectively cultivated grace, and their aesthetic quality lured many women into healthful exercise of this and other types. When I later studied with Delsarte's daughter in New York I found her shocked at the emphasis Americans had placed on exercise as a main feature of her father's work for actors.

At the close of the kindergarten course I was asked to go into partnership for a summer school to teach various types of exercise. This I did and the classes were so largely attended that at the close I decided to make a further trial of the field of physical training by lecturing and forming parlor classes in various cities of the middle west. Eventually I decided on physical training as a permanent profession rather than kindergartening, because for me it appeard to offer larger possibilities for the future and greater assurance of my own health. I have, however, always placed an extremely high value on my kindergarten training, both for its personal and pedagogical benefits. The grounding in general educational theory and history was invaluable later in my contact with schools.

Armed with a few social introductions, I lectured and taught for two seasons (1889-90) in Fort Madison, Davenport, Des Moines, and Keokuk, Iowa; Moline, Rock Island, and other cities in Illinois. The subject was new and the public responded eagerly, so that a lecture before a Woman's Club, or to an invited audience in a private home,

usually resulted in one or more classes, occasionally in a visiting position in a private school, or a class of grade teachers; but Boards of Education were not yet ready to spend money on anything so unacademic. I also gave many lectures on the subject under the auspices of churches, welfare societies or schools, using for the purpose a public hall, church, or assembly room, with admission charged and receipts divided between the society and the lecturer. At the close of a lecture in those days I usually changed to gymnasium costume and illustrated practical exercises, then to a Grecian costume to illustrate aesthetic exercise and expression work, ending with a dramatic reading. One smiles now at the program, but it achieved its object. The changes of costume required an adjacent dressing room that sometimes led to tragic results. In one church the promised dressing room proved to be a coal cellar with light only from a crack in the door at the front of the auditorium. My Grecian draperies were saved from a blackout only by a newspaper spread over the coal on which I stood. On another occasion, when the lecture was in the assembly hall of a new high school, I was given an adjoining class room to dress in, and assured that the absence of locks on the doors need give me no concern. All went well until I was changing to street dress at the end, when at the most critical moment a door was thrown open and in marched the Board of Education on a tour of inspection of the building. Of course I screamed and that moment was probably as unforgettable for the Board as for me. Then there was the time when the manager of a small hotel forgot to call me for a midnight train, and I wakened from a nap in the hotel parlor to hear the train drawing into the little country station. The wild dash with him and his old horse and buggy, the way he and the conductor helped me onto a moving train, and threw my suitcase to the rear platform, have been among life's nightmares. So was the final entertainment I was to give in the opera house at Fort Madison, for which several classes were united at the close of a long season. This final affair was under the auspices of one of the churches, which was to share receipts. Shortly before supper on the last afternoon we were all roused from needed rest at home to stand in a street crowd and see the opera house burn to the ground with all our costumes, its origin probably connected with new lighting effects that were being installed when we left the building. The entertainment was given two weeks later in an old hall, but what with new costumes, and extra railway fares and hotel bills, the only profit was made by a Cake Committee of the church which had been astute enough to put on a cake sale in conjunction with the performance. They were good enough to share profits to the extent of four dollars with a young teacher barely making her living.

With this pyrotechnic send-off and promises of classes in October, I closed my second, and what proved to be my last, season of midwestern teaching and went to Harvard for Dr. Sargent's Summer Ses-

sion of 1891. On his advice I had been preparing for this by continued study of Gray's *Anatomy* and Martin's *Human Body*. Through the help of a doctor on the faculty of the Iowa Medical College at Keokuk, I was able for a time on my weekly visits to that city to study anatomy at the college as a special student, and to observe a dissecting class at work. Also I had encountered a Stockholm graduate from whom I took a private course in therapeutic work. Dr. Sargent's personal lectures on applied anatomy and mechanics of exercise, were among the most helpful features of a richly crowded summer. Being especially eager for orthopedic work, it was very gratifying to see here also the distinguished Dr. Bradford and Dr Lovett, whose treatment rooms I was privileged to visit later. The broad, eclectic view of "systems" of exercise gained at the Summer Session, was necessary and helpful. We had exhausting drills from Mr. Herman Schrader in German gymnastics, and still harder from Mr. Nissen in Swedish. I was a fizzle on heavy apparatus, but Miss Ballintine or Miss Wilson used to ask me to demonstrate strokes in the swimming tank. We had some lessons in original dance-gymnastics from a Boston professor who had an enormous following, but I used to long ardently in those days for free dance work, the dance impulse not then having been thought of as an important part of physical education. It was at this summer session that I first came to know personally many men and women who there had their start, and later became leaders in the profession. In these late 1880's and early 90's the first normal schools were being organized for physical training; besides Dr. Sargent's Normal School, (quite independent of the Harvard Summer Sessions), there was Baron Posse's Normal School of Swedish Gymnastics, the Boston Normal School of Gymnastics, the New Haven Normal School of Gymnastics, the Savage Normal, Christian Association Training Schools, etc. For many years the content of normal courses in physical training was a live subject for committees and conferences. Those of us who took part in these were keenly conscious that we were helping to establish standards and raise to a profession a branch that had not then been so recognized.

It is interesting to note how many of the normal schools used the word "Gymnastics" in their titles. It was a period of gymnastic exercise, much of it in class or mass formation. This was largely because the most highly developed and organized methods came to us from abroad in that form. That so much formal work, taken as drill or to commands, was not inherently compatible with American individualism, is indicated by the proportionately smaller place since taken by such work, even though the pendulum may have swung too far. Rivalry between the Swedish and German systems of gymnastics was a major interest of the time and nothing could so enliven a meeting as discussion of their respective merits. Seldom was there a convention without such a number, and for years when things would seem particularly drab and unin-

teresting in either national or local societies, we could bring them to life by staging a discussion between a dynamic and witty Swede and a dynamic and rapier German. They always got mad at each other and paced the platform with a rising tempo of retort and gesture that stopped just short of the Sergeant-at-arms.

Another feature of this early period was the emphasis on exercise rather than on the condition and needs of the pupils. The medical profession was no more enlightened on exercise values than were laymen. Doctors who were asked to certify the fitness of pupils for exercise in my classes (always required) usually sent a blanket permission without inquiry or indication of the kind and amount of exercise. The only exceptions that excluded a pupil seemed to be cardiac lesions or recent illness or operations.

A potent influence making for the development of the profession at this time was the American Physical Education Association, now the American Association for Health, Physical Education, and Recreation. I had immediately applied for membership in this organization upon its first announcement, and am glad that the date gives me the privilege of being counted among the Founders. For years the annual or bi-ennial meetings, held in Boston, Philadelphia, New Haven, and New York, were a major source of inspiration, as conventions may always be, to many of us who were working in isolated positions, having to depend on our own judgment for meeting difficult conditions and establishing precedents. We all took our share in serving the Association in various capacities, on committees and programs or officially.

That Harvard Summer Session of 1891 made occasion also for my first visits to historic sites and literary associations in and around Boston and Concord, a profoundly moving experience. I planned to make a brief visit to family friends in New York City en route to the western classes, but nothing was farther from my thoughts than teaching in that city. New York had an immense prestige and this was to be my first visit; but to teach in that pinnacle of America? Where the subject was doubtless already far advanced? The thought would have seemed the height of presumption! But the New York friends said they had not heard of the subject there and suggested that I stay. Then a woman physician whom I had met at Harvard asked if I would take classes in the Harlem Young Women's Christian Association, which then had no such work, and this I engaged to do two nights a week for an indefinite period. This led to a parlor lecture and class among some charming Harlem women; the friends I was visiting, and two others, arranged for parlor lectures in other parts of the city, all of which resulted in classes and private pupils. I think the munificent fee in those days was $1.50 for private lessons, and $10 per pupil for a course of twelve class lessons. I visited all of the teacher's agencies in the city but received not the slightest encouragement from them. All positions for

the season, they said, had been filled in advance. One of these agents, however, allowed me to copy a list of all the private schools for girls in New York City. There were eighty of these and I called on every one, walking miles every day to save carfare. In each case I was able to talk personally with the head of the school, possibly because of the engraved visiting card I sent in to her. Out of the eighty, only one, Miss Spence, had any special provision or instructor for this subject. From the rest, two openings were secured which, with the private classes and Rutger's Female College, which a friend secured for me, assured a bare living for the next few months; so, being convinced that New York was not quite on the pedestal I had thought, that in physical education at least it was on a par with the rest of the country, and that perhaps I had something to teach it after all, I sent word to the western classes that I should spend the season in New York. This was quite a big leap in the dark, but I had already taken several and youth does those things.

One of the two private school openings in New York was with Miss Koues on West Ninety-fifth Street, who offered a fourth floor room and board in exchange for two mornings a week of physical training for her private school. The other was a visiting position in the well-known school of Miss North on Madison Avenue, in Harlem, where I taught for two years. After some months I received from Miss North a criticism which became a corner stone in all my future practice. "You are a graceful performer," she said, "and an effective leader and commander; but you do not teach. You see only the class and not the individuals in it. You do not correct faults." That difference between teaching and leading was one that I not only had to master myself, but in which I had to train every assistant who ever came to me in after years, whatever his or her preparation. It is a beginner's fault, a period in one's technical development.

Normal College, now Hunter College, was later added to my list. An interview with President Hunter resulted in an invitation to address the early morning assembly a few days later. I remember well the biting cold of that early morning, for I had not yet achieved furs; and very clear is the impression of sitting with President Hunter on the platform of the old building in Sixty-eighth street as the three thousand students marched in. He was justifiably proud of them and before introducing me had to reassure himself for the second or third time that I would not be afraid to address so large an audience, the largest I had faced up to that time. I have always remembered President Hunter, keen, kindly, tactful, and polished, with pleasure. A few days later the Trustee engaged me for two lessons a week to the senior class at $150 for the term. The college teachers arranged also for a private class, and so did pupils below senior grade, all held in the basement playground. This engagement played quite a part in securing for me the next year

the Directorship of Physical Training in the Brooklyn public schools, for it was the only place where the Brooklyn Committee saw my work, and of course President Hunter's commendation had much weight.

These visiting positions in New York schools were carried for two seasons, during which I continued lectures and private classes in the city, suburbs, and even farther away, four year in all of free lance work. In those last two years I was up two morning a week at half-past-five to make an early train for Newburgh, returning from there at midnight after a day and evening of teaching. The days at Mount Vernon were also especially strenuous. In after years, when young people came to me as a director, with their technical diplomas, begging with tears in their eyes for a position, anything whatsoever so they might earn some money, even a little, and then refused what we had to offer because it was not in a convenient neighborhood, or did not pay enough, or because they did not want to teach pupils of some particular grade, immediately I thought back to those early struggles when I was catching at straws in every direction, up and out for early trains and late trains, walking to save car fare, teaching pupils of all ages from kindergarten to senility, taking any fee I could get, or nothing if the opportunity might lead to later work. I thought back to those early days with unavoidable contempt for the lack of grit, and stamina, and purpose, the cowardice and softness, that refused to do what was hard, the selfishness that would receive an education but be unwilling to use it in anything but a comfortable berth. Any attempt to reason with such persons, to spur their ambition or rouse them to a larger view of their work and opportunities, was useless. I am glad to say that the majority of applicants were not of this kind, but I believe there are still too many people of this sort in the world, a menace to workers of character.

My third season in the east began as Director of Physical Training in the public schools of Brooklyn, then a separate city. It was the largest position of the kind at that time in or around New York, and just how I secured it may have some interest, especially as there was no political influence involved. After a lecture at the home of Mrs. Norman S. Dyke, on the Heights in Brooklyn, I was offered a letter of introduction to Prof. Franklin W. Hooper, the remarkable Director of the Brooklyn Institute of Arts and Sciences. Hoping for a lecture engagement at the Institute, I called by appointment upon Prof. Hooper, taking my letters of recommendation from western schools and classes. It was probably the most dramatic interview of my professional career. Prof. Hooper belittled everything I presented, training, experience, fields of work, credentials, until I concluded there was nothing to be gained from him, threw all courtesy and caution to the winds, and for the only time in my life flared back in wrath on every point. My preparation, I said, was as good as that of this or that well-known person, and I named them and gave the facts; he was mistaken about the west, it was far

ahead of the east in many things and New York was especially backward; everyone had to begin at the beginning, and I considered myself singularly fortunate in having had so much experience outside of institutions; as to letters of recommendation, no one could secure such letters as mine except on the merits of their work. I started to leave, but apparently this outburst was just what he had been trying to elicit, to see with how much spirit I might meet difficulties and discouragement, for suddenly he wheeled in his swivel chair to face me and said, "We will try to get this lecture in the March schedule of the Institute. Our regular fee is twenty-five dollars. And we are looking for a Director of Physical Training for the Brooklyn public schools. Was it your idea to apply for that position?"

I had not heard of the position until that moment, but it was an idea one could readily adopt, so I managed to get my breath and said, "That is my idea."

"Very good," he replied, "I will mail you an introduction to the Superintendent of Schools, Dr. Maxwell, and you would better see him as soon as possible. Good morning!"

The sudden reaction from the previous tension of the interview was so strong that I could scarcely wait to get outside his office and cried on the elevated train all the way up to Ninety-fifth street in New York. But he never knew that.

Prof. Hooper became one of the staunchest friends and supporters that I or the subject ever had in Brooklyn. He was one of the few university men on the Board of Education, and as Chairman for many years of the Committee on Physical Training, helped to put through many measures for the development of the subject. Beyond this, together with thousands of others, I owe his memory an inestimable debt of gratitude for the wonderful educational opportunities that he spread before us in the Brooklyn Institute of Arts and Sciences, bringing to its platform the most distinguished authorities in education, literature, the arts, music, social economics, science, exploration, statesmanship. It was a marvelous privilege, and Prof. Hooper was one of the truly great men I have known.

Superintendent Maxwell questioned me over a wider range than Prof. Hooper had done, and in a way, that made it easier to talk with him. He was interested in the fact that for a time I had been a regular news contributor to a leading paper and had sold a number of short stories to a syndicate, he himself having been in journalism. As I was of the last generation that could have secured such a directorship without a college education, it may be worth recalling that to his question about a college degree I answered.

"Of course the lack of a college education is something I feel keenly, especially when I come in contact with an educational institution; but I have measured myself by a number of college women and I am not

afraid of them. They have some things that I do not have, though I think I can make up some of them in time"; (he nodded); "but on the other hand, I have some things that they do not have."

"For instance, what?"

"I have traveled more than most college women that I know, and I am accustomed to meeting people and handling affairs in a larger way."

These qualifications seemed to impress him favorably, for he said they were very necessary for a directorship; that they had just had to discharge a man director of another subject because he had trouble in every school. One principal had put him bodily out of the building. Then he began asking me hypothetical questions on how I would meet possible situations in the schools.

"I think you could manage it," he said at last, and asked when and where a Committee of the Board of Education could see my work. I gave him my schedule and one morning a sub-committee, consisting of himself and Prof. Hooper, appeared with President Hunter and watched my classes at Normal College. On leaving they asked me to send in a formal letter of application for the Brooklyn position, and two or three months later the Secretary of the Board of Education notified me that I had been elected Director of Physical Training at a salary of $1200 per year, to begin in September, (1893) and to report immediately to the Superintendent of Schools. Most of that summer in the country was spent in arranging a graded course of gymnastic exercises, suitable for use in the class rooms, the only place for exercise in those days. Incidentally it may be stated that during forty years of professional work I can recall only one summer that was not devoted mainly to writing, lecturing, teaching, or research; so also was the major part of most Christmas and incidental holidays.

The impact with the public schools made two indelible impressions that deepened during all the years of my service. First, the incredible number of children; children by hundreds, by thousands, by tens of thousands, yes, and by hundreds of thousands. It was overwhelming. At the time the largest schools had thirty-five hundred pupils, but before long there were many schools with five thousand under each roof. And the next great impression was of the wonderful working of the huge organization itself. The Superintendent arranged that I should hold weekly meetings in different parts of the city with representatives from each school for instruction which they, in turn, would transmit to the class teachers. To go into the schools the morning after such a meeting and find all of the classes carrying out those instructions was almost frightening in the sense of responsibility involved. A third revelation as I came to know the teaching staff, was of their wonderful devotion to the welfare of pupils, so that to many new arrivals in this country the schools stood for all law, order, courts, and even the Federal Government itself.

The development of physical training itself, and its adaptation to the schools form another story, both in the ten years before "Consolidation," and after the formation of the Greater New York. In those Brooklyn days, as needs became apparent, I devoted each year to the development of one new phase in addition to carrying routine. The items themselves indicate how undeveloped was the field. Having secured a corps of assistants, I introduced games to replace the "whispering recess;" established methods of testing sight and hearing and organized a method of assigning seats according to those powers; made measurements of thousands of children in different racial groups, stripped for the study of contours. Among the many results of this latter research was the revision of tables for the adjustment of school furniture, so that little Italian legs were not dangling in the air, or tall German or Old-stock American backs rounded over desks too low. We measured and studied changes in the proportions and contours of chests, the natural shift in the position of scapulae, the development of natural curves in the growth of spine and tilt of pelvis. Applying principles from the new school of industrial, or efficiency, engineering, I worked out more definite methods whereby teachers could estimate the attainment and progress of their pupils in posture, the so-called "Triple-Test" which soon spread throughout the country. Out of all this there became apparent the need for an authoritative professional group that might standardize many conditions affecting posture both in schools and beyond them; to meet this need I organized the American Posture League in 1914, whose work, among other things, changed the habitual cut of clothing for men and boys to avoid the forward thrust of heads and constriction of chests, modeled seats on new principles which were adopted for New York subway cars, among others; gathered world-wide data from barefoot, sandaled, and shoe-wearing peoples which established three types of foot, inflared, outflared, and straight, instead of merely the inflared which had theretofore been the only type recognized; etc.

In the eighteen-nineties came the great development of physiological psychology, with William James, G. Stanley Hall, and George Trumbell Ladd in the fore-front. It was my privilege to attend a number of courses of lectures by each of these three men at the Brooklyn Institute of Arts and Sciences, and the adaptation of these new aspects of education to physical training added great zest to routine work. Bibliography on physical education was at that time extremely meager, and it was to meet, first of all, my own need for texts to put in the hands of teachers that each of my books on this subject was written.

An intimate and intensive study of democracy in-the-making and at work, made the most profound fascination of my experience in the public schools, a far greater thing than any special aspect of education however deeply one might care for that. The "gilt-edged" neighbor-

hoods, so called, where chauffeurs and nursemaids waited to take children home after school, did not interest me deeply; but the crowded tenement sections, where undeveloped standards of living, ethical sense, personal ambitions and ideals, and an embittered attitude toward all government, formed basic problems for our country, these showed the public schools to be our greatest bulwark, and appealed to all one's humanitarianism, sympathy, patriotism, and enthusiasm.

BIOGRAPHICAL DATA

NAME—JESSIE HUBBELL BANCROFT

BORN—December 20, 1867, Winona, Minnesota

ACADEMIC RECORD

Normal School, Winona, Minn., 1889, Kindergarten Training Course, Minneapolis School of Physical Education, 1888–9
Special student, Iowa Medical College, briefly, 1890
Harvard Summer School of Physical Education, 1891

POSITIONS HELD

Special instructor, physical education, 1889–90, Ida Institute, Davenport
Special instructor, physical education, 1891–2 Rutger's Female College, New York City
Special instructor, physical education, 1891–2 Normal College New York City
Special instructor, physical education, 1891–2 Harlem Y. W. C. A. New York City
Special instructor, physical education, 1891–2 Harlem Classical School for Girls, Miss North, N. Y. C.
Special instructor, physical education, 1891–2 Miss Koues' Private Sch. N.Y.C.
Director Physical Training Public Schools, Brooklyn, N.Y., 1893–1903
Ass't Director Physical Training Public Schools, Greater New York, 1904–1928

PROFESSIONAL AND ACADEMIC HONORS

Fellow, American Association for the Advancement of Science
Member, National Institute of Social Sciences
Honorary Diploma, Sargent Normal School of Physical Education
Gulick Medal for Distinguished Service in Physical Education
M.P.E. (Master Physical Education) Honorary Degree, Springfield College
Fellow, American Academy of Physical Education
Fellow, American Physical Education Association

MEMBERSHIP IN ACADEMIC AND PROFESSIONAL SOCIETIES

A Founder and Member, American Physical Education Association, Secretary, 1901–2
President (Founder) American Posture League 1914–1922
Board of Directors, Girl's Branch, Public School Athletic League, N.Y. 1904 to date (Executive Secretary one year)
Brooklyn Council, Girl Scouts of America, 1919–20
Chairman and Founder Section on Physical Education, Brooklyn Institute of Arts and Sciences, 1893-1915
National Council Administrative Women in Education, 1924-28
Society of Industrial Engineers, (Committee on Fatigue)
Efficiency Society, 1913
National Education Association 1893-1928
New York State Teacher's Association
Brooklyn Teacher's Association
American Child Health Association

American School Hygiene Association
National Health Council
etc., etc., etc.
Author's League

LECTURES AND OTHER ITEMS

Lecture courses, Brooklyn Institute of Arts and Sciences, several years
Savage Normal School of Physical Training, several years
Lecturer Summer Schools of Physical Education
Columbia University, 1901-2-3
University of Utah, 1908
University of Saskatchewan, 1920
Stanford University, 1920
Occasional lecturer at many schools, colleges, universities, societies, etc., including Vassar College, Holyoke, Oregon, etc.
War service, Founder and President, American Cooked Food Service, New York City and Princeton, 1917-18

PROFESSIONAL PRODUCTIVITY

Books

School Gymnastics, Free-Hand, D. C. Heath & Co., Publishers, 1895
Spanish Edition, 1915
School Gymnastics with Light Apparatus, D. C. Heath & Co., Publishers, 1897
Recess Games, Spalding Athletic Library, 1895
Handbook, Girl's Branch Public Schools Athletic League, 1906
Games for the Playground, Home, School and Gymnasium, The Macmillan Company, Publishers, 1909
The Posture of School Children, The Macmillan Company, Publishers, 1913
Handbook of Athletic Games, 1916
Games (Revised and Enlarged Edition), The Macmillan Company, Publishers, 1937

Articles

Physical Training, Encyclopedia Americana
Games, Encyclopedia Americana
Games and Play, Child's Encyclopedia (World Book)
Many miscellaneous articles on various phases of physical education in the Physical Education Review and many other periodicals
Occasional literary work, unsigned

HOBBIES

Walking, mountain climbing, horseback riding, gardening, literature, music, theater, travel

PIONEER WORK IN PHYSICAL EDUCATION

This record extends from a period when pioneer work was necessary to create a demand for physical education, to a time when the demand exceeded the supply of teachers. Scores of lectures (in addition to the technical lectures noted above), were given in many states, before institutions, societies, and clubs, for this general purpose of rousing interest among the public and educators; I published many articles in the periodical press for the same purpose.

This was also a period when standards were being formulated and established to lift the whole subject to a professional basis, and methods worked out for adapting it to various school and other conditions. All pioneer workers of the time were engaged in such work, both in the individual field and in a wide range of committee work, conferences, and conventions. Many of the latter were national in scope, and included calls to conferences from State and Federal authorities.

RESEARCH (By J. H. B.)

Several extensive anthropometric studies, with accompanying laboratory experiment and application. These include:

Measurements of racial types in the public schools, in relation to the adjustment and modeling of school furniture.

Chest diameters to verify growth changes in the proportions of the chest.

Chest expansion and lung capacity in relation to types of exercise.

Shift in position of scapulae from infancy up.

Statistical and other special studies of posture.

Deviations from normal sight and hearing.

(The work noted above was for the public schools.)

For technical committees of the American Posture League.

Collected world-wide data on types of foot structure, among barefoot, sandaled, and shoe-wearing peoples.

Measurements of several items of height in racial types of adults in New York City, for subway car seats.

Pelvis and scapulae measurements in children and adults for seat modeling.

Chest and shoulder measurements in men and boys to correct schedules used in the ready-made clothing industry.

Games: American and foreign research, directly among the people and bibliographical.

Anne Barr Clapp – A Pioneer in Physical Education

THE college girl of today, with her liking for sports and physical activities, enters a course of training well planned and with a definitely prescribed curriculum. This was not the case back in the "Gay Nineties" and it was largely by chance that Anne Louise Barr "drifted" into a work which now places her among the pioneer educators in the field of Physical Education for Women.

She entered the University of Nebraska in the early nineties as a special student. At that time very little attention had been paid to physical training, either at the University or in the city. A Y.M.C.A. building had recently been built, with a well equipped gymnasium and swimming pool, and here the young women of Lincoln had their first training.

On the campus Grant Memorial Hall housed the Military Department and the gymnasium classes for both men and women. These were under the direction of Dr. Wilbur P. Bowen. It was here that John J. Pershing, Lieutenant Tenth Cavalry, United States Army, Commandant of Cadets, and later General of the American Expeditionary Forces in France during the World War, had his office. "The Lieut.," as he was familiarly called, occasionally drilled the girls in the manual of arms and in military marching. He also taught them fencing. Dorothy Canfield Fisher, daughter of Chancellor James H. Canfield, was one of his pupils.

Having had some previous instruction in Indian clubs, wands, and dumbbells at the Y.M.C.A., Anne Barr was selected the following year to assist in the classes. She likes to tell how Mr. Bowen would come around each month, jingling some coins in his pocket to pay her and the pianist their meager salaries.

At this time a choice had to be made — whether to continue her musical education or to enter the new line of work now opening before her. Determined to equip herself properly she attended the Anderson Summer School of Gymnastics at Chautauqua, New York in the summer of 1894. In 1896 she entered the Sargent School of Gymnastics at Cambridge, Mass., attending a part of the winter term and continued through the following summer. It was during these eastern trips that she became acquainted with Dr. Jay W. Seaver, head of the Physical Education Department of Yale University, who did much in shaping her later work.

In the fall of 1897 she went to Sweden and spent the following year in the Royal Central Gymnastic Institute in Stockholm, being the

second woman from the United States to attend the Institute. Here she did intensive work in corrective and Swedish gymnastics. Through personal letters to friends of Dr. A. H. Edgren, a native of Sweden and Professor of Romance Languages at the University of Nebraska, she was permitted to observe the work in the Normal Schools in Copenhagen. She spent several weeks in Berlin where again she was permitted to observe work taught in the schools there. Women from other countries were not allowed to participate in this type of work and only because of a most official looking document of introduction given her by Chancellor George E. MacLean was this privilege granted.

During her year in Stockholm the first effort on the part of the Swedish government was being made to collect the native folk dances. Groups from the various provinces would return to the Royal Central Institute and teach the dances to those attending the Institute. Consequently, upon returning to the United States, Anne Barr had a notebook full of directions and music for the dances, together with a number of costumes typical of the different provinces. Her publication of this material the following year was the first of its kind in the United States.

The University of Nebraska claims the distinction of teaching these dances as early as any other institution in the country. The following summer, 1899, they were taught by Miss Barr, at the Chautauqua School of Physical Education, at Chautauqua, N. Y., and like the ripples from a stone thrown into a pool, her influence spread as a teacher of folk dances.

It was at this time that she joined the faculty of the Chautauqua School and there for the next ten years she taught anthropometry, Swedish gymnastics, and folk dances. Here it was that she was associated with such leaders in Physical Education as Dr. Jay W. Seaver, Dr. W. G. Anderson, Jacob Bolin, Henry S. Anderson, and many others. Here also she met Raymond G. Clapp, Yale 1899, a member of the Chautauqua faculty, whom she married at Jamestown, N. Y., on August 19, 1903. In 1902 Dr. Clapp became director of the Men's Physical Education department at the University of Nebraska and has continued in that position to the present time.

In 1908, in collaboration with Carl G. Bjerstedt, of the Chautauqua School of Physical Education, Anne Barr Clapp issued a second and more complete collection of Swedish Folk Dances.

In the fall of 1898 Dr. William Walter Hastings came to the University as Professor of Hygiene and Director of the Gymnasium. To him credit is due for starting the professional training course in Physical Education. In outlining the courses he was ably assisted by Miss Barr. Two years later, June 1900, the first Physical Education certificate was granted to Alberta Spurck, who also received her Bachelor of Arts degree at the same time. Little was thought of the event then but forty years later it was conceded by Oberlin College, who had

claimed this distinction, that Nebraska had preceded her by two years.

Physical examinations were required of the girls in the gymnasium in the early years. Charts available for the plotting of measurements were based on age. Miss Barr believed that a girl of sixteen, whether she was five feet or six feet tall had a right to her own proportions, so with that theory in mind she compiled an anthropometric chart based upon height, using the measurements taken in the metric system, of a thousand University of Nebraska girls. This chart was published and copyrighted in 1899.

Mrs. Clapp continued her teaching at the University from 1894 to 1908, advancing from the title of assistant to Adjunct Professor and Director of the Women's Gymnasium. In 1918, when many of the younger women of the country were engaged in various kinds of war work, Mrs. Clapp again took up her duties at the University of Nebraska and with the title of Associate Professor of Physical Education and Director of the Women's Gymnasium carried on the work of the department for the next two years.

In June of 1940 the Physical Education Department celebrated the fortieth anniversary of the granting of the first certificate and at the same time honored Anne Barr Clapp as the founder of the professional department and the one who had set the high standards for those who have followed her.*

*This article was prepared by Adelloyd Whiting Williams who was one of Anne Barr's first pupils.

Ethel Perrin – an Autobiography

1888

MY FIRST experience in Physical Education came when I was in boarding school at the Howard Collegiate Institute in West Bridgewater, Massachusetts. A graduate of the Sargent School came to give us exercise twice a week in the attic of the schoolhouse. I remember the horror among the students at the physical examination, when we were measured from top to toe, but it did not bother me. Exciting pieces of apparatus were established on the walls of our so-called gymnasium, mostly pulleys and adjustable weights to be worked while we stood or sat in various positions. We each had a card showing where we fell short in our measurements and telling how many times we should pull up how many weights in each machine, in order to make us absolutely symmetrical. My left forearm used to ache in my conscientious efforts to make it the same size as my right. The only other bit I can remember is the flying trapeze. Only the good could use it and being the only pupil who tried to do what the teacher wanted, I was the sole user of the trapeze. One other memory is having to lie between blankets on my bed for a half hour after the lessons. Again I was faithful.

My principal was a personal friend of Amy Morris Homans and recommended upon my graduation in 1890 that I attend the Boston Normal School of Gymnastics, then in its second year, under the leadership of Miss Homans.

1890-1892

In two eye-opening years under strict guidance by Miss Homans, I learned how to face facts, assume responsibility, and consider the rights of others, all by the method of trial and error—mostly error it seemed to me. Dr. J. Claes Embuske taught me Swedish Gymnastics as a sort of religion. I was an apostle going forth to redeem the world.

1892-1906

It was a happy day when Miss Homans offered me a position as an assistant instructor in the Boston Normal School of Gymnastics. She told me my greatest handicap would be overcome in time, my age. I assisted any teacher who happened to need me but gradually was given the responsibility of some of the private classes in the gymnasium, until this became the larger part of my work. I taught games, dancing, and anthropometry to the professional students.

1906-1907

Miss Homans wisely thought fourteen years in one spot was enough and offered me an opportunity for two years of substitute work, one for my classmate, Senda Berenson, at Smith College, and one for Bertha Stuart, at the University of Michigan. In the first year, I learned to adjust myself to a conservative group of girls, and in my second year, to a typical free and easy midwestern group. My astonishment was great on my first cross country walk with an Ann Arbor group, when a girl said, "What a pretty dress you have on." That would never have been said to me in Northampton.

My formal type of gymnastics grew to seem less vital than it did in Massachusetts, and my work became more informal. The individual pupil began to mean more and I gained a new point of view. Being a substitute, however, I did not wander far from the program organized by a returning director.

1908

A secondary school principal wrote to Miss Homans for someone to organize Physical Education for girls in the largest and most progressive high school in Detroit. Knowing my enthusiasm over the first year in Michigan, Miss Homans recommended me and I brushed up my anatomy and kinesiology, bought a new pair of gloves, and met with the Principal and the Superintendent of Schools in Detroit. They asked one question, "Can you swim?", they having just completed the first school swimming pool, and upon my gasping "Yes, I can swim," never having heard of a pool in a high school, they hired me because of Miss Homan's recommendation.

This was my first opportunity to organize, with no one near who could even advise. The principal was cooperative and stood strong behind me when it came to substituting other activities for the one and only interest the girls had along my line, namely, a basketball team that could beat the other two high schools. Women outside the school system had been coaching the teams gratuitously and the rivalry was strong. The principal was ready to drop the school team immediately, but because the year's schedule was already made and the other two schools had nothing to substitute, it seemed best to run the schedule as planned and hope that what I had to offer would be of greater interest. It worked, partly because I was too busy keeping the gymnasium and the swimming pool full to capacity to give "the team" time enough to make them winners, and also because the members of the team were using their energy organizing and coaching other teams.

1909-1923

The next year I was again at Central High School, with an assistant just graduated from my old school in Boston. The day we opened, the Superintendent of Schools asked if he could put my name before his

Board of Education that evening as Supervisor of Physical Education in the Detroit schools. He told me he had already tried two and they had been failures. He wanted me because a member of his Board was presenting the name of a man who would put the German system of gymnastics in and this the Superintendent did not happen to want.

Not feeling much complimented and knowing nothing of supervision, either theoretically or practically, I consented to having my name put up in opposition to the German. Because the Superintendent was what was called "very strong" with his Board, I won. My young assistant was furious—"When I graduated I only needed a little tact and they sent me out here to get it from you."

During the next fourteen years my department made a steady growth. This is indicated in one way by its size. We were three men and three women teachers with one supervisor in 1909. This grew to three hundred and fifty teachers and fifteen supervisors before I left. The character of the work improved greatly as the trained teachers took over the activity programs in the elementary and junior high school gymnasia.

The classroom teachers did great service up to 1918, but the real freedom and growth came with the organization of the Platoon system in the elementary schools and the use of the 6–3–3 plan in the general education program. With every child having sixty minutes of daily physical activity in school time and plenty of after school organized athletics, there was an opportunity to reach important objectives. The department took over the responsibility of Health Education and forty teachers gave their whole attention to this phase of the program. It became of such interest to me that when I was offered a chance to join the staff of the American Child Health Association in New York, I accepted. This offer came because I attended a summer conference held in the interest of health education at Lake Mohonk in 1922. I was the only teacher of Physical Education to accept the invitation to attend, and as the people who planned the conference were looking for someone to represent Physical Education in this national association, they gave me the opportunity. Again good fortune followed me.

1923-1936

As the Associate Director of the Health Education Division of the American Child Health Association, I spent thirteen delightful years in comradeship with educators from all fields having a common interest in making health a vital part of school programs. I traveled over the country to interpret to those in the field of Physical Education where and how they fitted into the picture, and to stress to the general educator and to those interested in other phases of health, the importance and the place of Physical Education in an inclusive health program. I attended conferences, large and small, making contributions from the

platform and in small group meetings. From the central office, I sent articles to magazines and newspapers through our Publicity Division, and I talked over the radio. I also had a large correspondence with classroom teachers who asked us for help. From these letters we learned the needs of teachers and we prepared our printed material and planned our conferences to meet these needs. Being a part of a national movement brought a new satisfaction, but a far less definite one than that which comes from seeing results from efforts focussed in one locality. In 1936 the American Child Health Association closed its doors and the doors of my farm opened wide and have been open ever since.

My greatest side interest was the Women's Division of the National Amateur Athletic Federation, as a member of its Executive Committee for all but the last few years of its existence.

My fourty-four years of professional life were uninterrupted. My vacations grew shorter and shorter but my health never failed me nor did my spirit ever waver. To this I owe the great happiness from my work.

Brewster, N. Y., February, 1941.

Lillian Curtis Drew

LILLIAN CURTIS DREW was a direct descendent of Sir Edward Drew, knighted by Queen Elizabeth in 1589, whose grandson John Drew, born in Devonshire, England in 1642, arrived in Plymouth, Massachusetts in 1660. Here the family remained in direct line until Lillian Drew's father, Stephen Curtis Drew, enlisted at Plymouth, April 1861, in answer to President Lincoln's first call for troops for three months' service and again, at the expiration of his term, reenlisted "for the duration" in the 18th Massachusetts Volunteers. He fought in all the battles of the Potomac, was wounded in Grant's assault on Cold Harbor and rose in rank from private to First Lieutenant, Acting Captain. His family moved to Boston shortly after the war where he met and married Lillian Drew's mother, Martha Glover, whose ancestor, Henry Glover, born in Lancaster, England in 1603, came to New England and settled in Dedham, Massachusetts.

Through her paternal grandmother, Sally Faunce Drew, the line goes back unbroken through Elder Thomas Faunce to John Faunce who arrived in Plymouth, Massachusetts in 1623. Elder Faunce was one of a committee of three appointed to identify for all time the Rock upon which the Mayflower Pilgrims first stepped in 1620. This is now history and is mentioned in the prepared speeches which are given by attendants at Plymouth Rock for the information of tourists.

Lillian Drew was born in a four story brick house, built in 1820, at 70 Myrtle Street, Boston, on Beacon Hill, just over the crest of North Slope, at that time and for many years to come, one of the best sections of Boston. She was the eldest and only girl of four children. Her family life was of the type one reads about but seldom experiences. After dinner the entire family retired to the library where shelves, crowded with well thumbed books, occupied all available wall space. Then followed an hour of reading aloud by the father when the children were little; silent reading later; perhaps discussion of a book, play, or poem; sometimes games or hand crafts, and always a "snack" before retiring. Even after the children became adults and their varied and more intensified interests found them upstairs or down, entertaining or being entertained, the family conclave and repast was scheduled at ten o'clock each evening. Mr. Drew would stand at the front stairs so his voice could be heard north, south, east, and west and call, "Lillian, Thomas, Alden, Charles, Mother and I are waiting" and often, as an extra inducement for haste, he would mention in his summons the particular kind of food awaiting consumption. Events and problems of the day, plans for the morrow furnished lively conversation and discussion for at least an hour. There were musical evenings also, with the young

Lillian at the piano. College songs and Gilbert and Sullivan's operas were learned and sung by family and friends. The family attended the Church of the Advent, Episcopal, and Lillian Drew became an active and ardent worker in the church. Her father was a member of the Corporation and Vestry. Togther they made a study of the Bible and of the various religions. She was a member of St. Agnes Guild and the Altar Guild. Many altar cloths, amices, and stoles were embroidered by her for the church.

Lillian Drew attended the Bowdoin Grammar School for Girls on Myrtle Street and later graduated from a Boston high school. In 1891 she entered "B.N.S.G." (Boston Normal School of Gymnastics) of which Miss Amy Morris Homans was the director. At graduation in 1893, Miss Drew was chosen class Historian and read a fifteen page paper. For the anatomy class she speaks of "two amiable skeletons of fascinating mould, whose movements were startlingly realtistic." Also, "In the beginning of April 1892, the members of the class had attained such proficiency that a great number of them took advantage of a short vacation to pay a visit to the city of Philadelphia, with a view of astounding the natives of that sequestered metropolis. In the intervals of relaxation from their arduous missionary labors in this field, many of the students added to their store of knowledge by wandering through a large bazaar that bore upon its front the mystic name of "Wanamaker." Of Miss Homans she wrote, "Never would it be possible for any member of the class to forget her who was their director and their friend. With what untiring energy she worked, with what consummate tact she managed all the details of her trying position, with what enthusiasm she entered into all their plans, each one was ever ready to testify, and the example of her quiet dignity never will fade from their memories." The Boston Normal School of Gymnastics became an integral part of Wellesley College in 1909 when Miss Homans was made director of the department of Hygiene and Physical Education and continued in this capacity until she retired in 1918, when she was made Professor Emeritus.

With the exception of a three-month coaching trip through the British Isles in 1906 and short trips to Digby, Nova Scotia, Miss Drew spent her vacations with her family in their summer home on the bluffs at Manomet, Massachusetts, about nine miles from Plymouth. Here she became a strong and expert swimmer. She had her own sail boat, a 40-foot center board dory with a lug-sail which she named "Bogey" and which she sailed on Manomet Bay with ease and confidence, handling it without mishap in many a "blow," quite to the envy and admiration of her younger brothers.

In her more quiet hours, with board and water color kit she explored the woods and fields for wild flowers and painted her findings under date of discovery with remarkable skill. Many of these are

painted on blank leaves and margins of her text book with such minute detail that they appear to be part of the edition.

Not content with busy vacation days she spent many evenings studying astronomy. With book and chart she memorized what she should find in the heavens at different times, then taking a rug she would lie out on the grass on the edge of the bluff and find them. She soon became confidently familiar with the stars, planets, and constellations, regarding them as friends, watching their shifting positions, the departure of some, the arrival of others. Week ends, when the family had guests from Boston, and an evening on the porch seemed particularly inviting, Miss Drew would get out her banjo and start a round of songs. Sometimes, given the impetus, an impromptu musical skit with costumes would be worked out. By this time a few of the neighbors would wander in and the "budding artists" had the essential spur to success, an audience.

In 1894, Miss Drew entered the office of Dr. E. H. Bradford and Dr. E. G. Brackett to fill a position as instructor of corrective gymnastics. It was here, under wise and kindly guidance, that she acquired the vast and accurate knowledge and varied experiences that were to serve her so well in later years in her teaching and writing. She was very happy here amid the excitement of the office cases, each one a special problem, a new challenge.

In 1909, Dr. Thomas D. Wood, director of Physical Education at Teachers College, Columbia University, wrote to Dr. Brackett of a vacancy in his department for a teacher of corrective gymnastics and asked him to recommend a person of experience. The unselfishness of this great character, Dr. Brackett, prompted him to decide that Miss Drew should apply for the position, although she had become almost indispensable in his office during her fifteen years of service. He told Miss Drew of the letter saying, "It is a great opportunity for some one and I shall recommend you because I know you can do it." Miss Drew was aghast at such an offer, swamped with mixed emotions, treading on air and sunk in the depths of an inferiority complex. After breaking the news to her family, she sought comment from a very dear friend in Providence who, in her dry humorous way, telegraphed, "Accept before they change their minds. What good fortune to have been born and educated in Boston and now perhaps, to live in New York."

The interview took place in Dr. Wood's office in May or June 1909. Miss Drew spent her vacation taking courses in Harvard Summer School and began her work at Teachers College in the fall semester of that year. In this broader field, her perspective and capacity for achievement had just the incentive required for encouragement and growth. She liked her work, she lived her work and gave her all to insure its success. "Veni, vici" and I must conquer! With this thought in mind and a sixteen-inch statue of "Winged Victory" on her desk as an added inspir-

ation, she grasped the reins, took her stance as a charioteer of old might have done and said, "Go."

During her ten years of connection with Teachers College she lectured in the theory and practice of corrective gymnastics, kinesiology, anatomy, and physiology. During summer sessions 1911-18, she taught corrective gymnastics and kinesiology. Those ten years were probably the brightest in her life. She was firmly established professionally, her advice was sought by teachers in the field, invitations for speaking engagements and consultations were numerous, and offers of positions in three other colleges were advanced. These were all flattering at the time but her real interest was in the students she was teaching who would some day be the teachers who would carry on. To them she gave not only the text but the benefits of her wide experience in such an unselfish way, holding nothing back which she might want to use as new in a speech or an article or the book which was at this time being planned. She had the happy faculty of impregnating her lectures with anecdotes and bits of humor. These often appeared as pure entertainment, a break in a tense period. Sometimes they were but more often they were cleverly inserted at just the opportune moment to drive home an important fact! Psychology, pure and simple and it brought results.

During this period, Miss Drew made new and lasting friends, attended the opera frequently and, to a lesser degree, light opera and the drama. She knew music, loved it and could recognize almost instantly any classical music she heard. Within this time, World War I was being fought. On January 1, 1918, Miss Drew was offered a position as Head of Reconstruction Aides for the War Department at Washington, D. C. She did not accept, but offered her services in any capacity the government wished to designate and which could be carried on in connection with her work at Teachers College. Return mail brought her appointment, by Surgeon General Gorgas at Washington, D. C., as Supervisor of Reconstruction Aides for War Service. This meant that all aspiring reconstruction aides in Eastern United States, after having completed their instruction and having passed a physical examination, had to be interviewed by Miss Drew for a personality and general fitness test before sailing. Her word was final. Reports of these interviews are on file in the War Department in Washington, D. C.

In 1918-1919 the demand for instruction became so great that Miss Drew organized and directed three courses in physiotherapy for training aides to serve in hospitals both in this country and abroad. Another class, which was rather unique, consisted of one hundred cadets from the United States Naval Hospital in Brooklyn, who came to Teachers College daily in uniform for six weeks where they were given training pertaining to the medical branch of the service. Miss Drew's "bit" was to teach massage and bandaging to this group twice a week. At the conclusion of one lecture Miss Drew announced that on Thursday she

would teach massage for the arches of the feet. The officer in charge of the cadets rose and called, "Attention, every man clean socks Thursday morning."

In 1919 Miss Helen McKinstry and Miss Amy Morris Homans succeeded in persuading Miss Drew to sever her connections with Teachers College to become Head of the Department of Individual Gymnastics at the new Central School of Hygiene and Physical Education which was being founded by its director, Miss McKinstry, and which would open its doors in the fall of that year. This school was housed in the Central Branch of the Y.W.C.A., 610 Lexington Avenue, New York City.

During the decade spent here, Miss Drew lectured in individual gymnastics, massage, kinesiology, and anatomy. She was made Assistant Director of the school in 1924. She also served as Head of Corrective and Remedial Gymnastics in the department of Physical Education at the Central Branch Y.W.C.A. These classes were attended mainly by business women who were buckling under the strain and monotony of their positions in particular and civilization in general. They needed their bodies rebuilt and a new mental outlook. This work meant evening classes but Miss Drew answered the call because the need was so urgent and the results so gratifying.

Although demands on her time for outside activities were pressing, Miss Drew's real interest was, as always, in the students. Her aim was not only that they should absorb the lecture material but that they should take on some of the characteristics which would insure their success in the teaching field. To this end she labored incessantly with tact and skill as a sculptor works with clay, shaping and molding it into a form to fit his vision, hoping it will be a masterpiece. Her office door was always open for student consultations whether on school or private matters. Usually the difficulties which seemed insurmountable were eradicated or reduced appreciably in magnitude during the interview. The student felt Miss Drew's sincere and real interest in her problem, the patient and keen understanding, the wisdom and justice of the advice. This gave the student a feeling of confidence in herself and, oh, what strides can be made from that starting line. Confidence in one's self is not acquired as one absorbs a fact, nor can it be established as the result of a command. It grows from within, nurtured by feeling and emotion. If the case were of a really serious nature or the student one who was likely to succumb to doubts and fears over night, Miss Drew made it part of her schedule for the next day to follow up the interview by "accidently on purpose" being at a spot where she could extend a cheery greeting and a word or two of further encouragement to the student. Miss Drew was a natural-born psychologist.

In addition to her duties at the Central School of Hygiene and Physical Education, Miss Drew miraculously found time and energy

for the following: lecturer in Individual Gymnastics and Kinesiology, Hunter College, 1921-1923; lecturer in Individual Gymnastics and Kinesiology, New York University, 1922-1928; graduate course in Individual Gymnastics and Kinesiology, Central School Summer Session, 1923; vice-president, American Physiotherapy Association, 1920-1922; posture expert, orthopedic examinations, St. Agatha Private School, 1924-1930; chairman, Therapeutic Section, American Physical Education Association; member of the Board of Directors, American Posture League, 1921-1930.

As technical advisor on Posture for the League, Miss Drew assisted in solving many problems presented to the League. In her work on the Clothing Committee she designed underwaists for children, girdles for adolescent girls and women, and other wearing apparel. Her work on the Committee on Educational Material included the preparation of an outline for a set of lantern slides for lecturing purposes; acting as the League's representative in reviewing a film on Posture; giving demonstrations on the Mosley-Lesley Schematograph; and assisting in the preparation of illustrations for wall charts emphasizing posture.

In 1924 Miss Drew became intensely interested in the movement then taking place in the high schools of New York City to introduce "individual health training" as a specific part of the health education program for girls. In the new high school buildings provision had been made for this type of work by setting apart a large room with proper equipment for the individual students with remediable defects. Through the cooperation of Miss Josephine Beiderhase, Assistant Director of Health Education, Miss Drew gave special courses in individual gymnastics which were planned to meet the needs of the teachers assigned to this work in their respective schools. Many of the teachers availed themselves of Miss Drew's instruction and were enthusiastic about her methods which were not only scientific but eminently practical.

Miss Drew's interest did not stop with instruction but, at the request of department heads she visited the schools, gave inspirational talks in student assemblies, watched the teachers at work, and spoke at departmental conferences. Her enthusiasm and professional counsel proved to be a great help in the conduct of individual health training in its early stages in the New York City high schools.

On the fly leaf of Miss Drew's book, "Adapted Group Gymnastics," she wrote the following inscription: "To the teachers of Physical Education in the Public Schools whose interest in individual gymnastics and zeal in furthering the work have inspired the author to prepare this volume."

Miss Drew's plans for a book, which had been taking shape and gaining momentum for many years, were finally consummated and the material went to press in 1922 under the title, "Individual Gymnastics," published by Lea & Febiger of Philadelphia. This book supplied a long

anticipated and urgent requirement in the field of physical education. It met with instant success and was kept notably vital by revisions, the fourth and last written by Miss Drew in 1929.*

Her second book, "Adapted Group Gymnastics," was published by Lea & Febiger in 1927. This book was written to meet the needs in public and private schools, camps and colleges, where the programs necessitated the handling of large groups.

Several articles for magazines were contributed by Miss Drew, including the following:

MAGAZINE ARTICLES

"Posture as Influenced by Environment," *American Physical Education Review*, January 1913.
"Is Your Health an Asset or a Liability?" *Housewives Magazine*, November 1917.
"The Training of Physiotherapy Aides," *Mary Hemenway Alumnae Association Bulletin*, 1918–1919.
"The Place of Exercise in the Correction of Postural Defects," *American Physical Education Review*, November, 1920.
"Work for the Weaker Women," *American Physical Education Review*, June 1921.
"Ways and Means of Overcoming Inefficient Posture," *American Physical Education Review*, January 1923.
"Highroad to Good Posture," *Physical Training Magazine*, February 1924.
"Corrective Gymnastics in a Physical Education Program," *American Physical Education Review*, February 1926.
"Individual Gymnastics in a School Program," *New York State Education Magazine*, April 1927.

RADIO TALK

"Is Your Child Growing Up Straight?" January 28, 1925.

FILMS

"Schematography"—taken at Teachers College, May 1918.
"Standing Up for Uncle Sam"—taken at Teachers College, May 1918. Miss Drew directed the exercises, demonstrated the schematograph and appeared in many of the shots herself, for the above films.

MOVIES

"Posture"—taken on the beach at Spring Lake, New Jersey, 1926. Produced by Symonds Film Company of New York, under the direction of William Ralph La Porte, Professor of Physical Education in the University of California, Los Angeles. Miss Drew contributed the exercises and supervised the filming of them.
"Posture"—taken by Eastman Kodak Company as one of a school series, 1929–1930. Miss Drew assisted Dr. C. E. Turner of the Department of Biology and Public Health, Massachusetts Institute of Technology at Cambridge, Massachusetts, with the scenario and directed the filming of exercises for correcting faulty postures.

Speeches at conventions, dinners, anniversaries, and alumni associations were far too numerous to mention, as were many committee and

*A fifth revision is now in preparation.

group meetings but they proved to be exhausting time consumers. There were no dull moments in Lillian Drew's life.

From her sturdy ancestors she inherited a strong body and a sound mind; at times her strength and energy seemed superhuman. Being cognizant of this great reservoir of force often tempted her to draw too heavily on it, even to the extent of physical harm. A nervous temperament and an above-normal blood pressure were her enemies during her professional life, but she cast them aside and pushed on toward her goals, ever higher and higher, spending herself freely in her devotion to her ideals. She was one of those outstanding persons whose profession is followed for larger values than mere livelihood. Of her time and her clear intellectual grasp and insight, she gave unstintingly, not only to help individuals with her skill but to advance her profession. Through long years of scientific study and research she worked out certain principles of technique and original methods of procedure which she passed on to her students. Concerning the technical aspects of Posture she was one of the most clear sighted, rational workers in the field and highly gifted as she was with the power of a true teacher she passed on her rich store most effectively and generously to students and to outside sincere groups.

The greatest force in the world is personality. Miss Drew was herself at all times, never posing, never superior, always approachable. She possessed a rare combination of dignity with a genial and affable manner. Though firm in her convictions, she was charitable to those who held opposite views. She had an open mind and a decided intellectual curiosity which made her grow with her work. Her horizon was constantly being pushed farther from her grasp. She never met it, she never finished investigating, learning, uncovering latent abilities. There seemed to be no limit to her mental capacity, her vision knew no bounds.

Miss Drew was magnetic. She spoke and worked with vigor, Her enthusiasm was contagious, her conversation, her lectures were alive, pulsating! The sterling, lovable, dependable qualities of her character were felt in any association with her. She had a delightful sense of humor which seemed to fit any occasion and she enjoyed a good joke even if she were the victim. She could always see the humorous side of a situation and this characteristic came to her rescue in many a tense moment. Her enriched vocabulary was singularly efficient in the embellishment of a tale. Miss Drew was very fond of reading both prose and poetry and could quote freely from the classics. Her love of books, of the best in literature, coupled with her phenomenal memory made her an interesting conversationalist and must have given her much inward joy.

After the strenuous college year Miss Drew looked forward to a vacation of relaxation. She was fond of traveling particularly if the destination could be reached by boat. A splendid sailor, she was never happier than when on an ocean liner where she enjoyed the tang of the

cool sea air. In her travels she was attracted by the rare and the exotic, by places and things which had a meaning, a background. She never bought anything just because it was popular or pretty. Thus she surrounded herself with treasures whose attraction lasted, among them a fine collection of old Chinese prints.

In 1929 the Central School of Hygiene and Physical Education became affiliated with Russell Sage College in Troy, New York but, because proper facilities were not available in Troy, the school remained in New York for one year. At the time of the affiliation, Miss Drew was made Assistant Professor of Physical Education at Russell Sage College. In June 1930 she retired from active teaching, when the school moved to its new quarters in Troy, thus completing ten years of very active service in the school.

Miss Drew had hoped and really planned on a few years of rest and freedom from "must be done" things but, death, who is no respecter of desires or persons claimed her on November 23, 1930. To her friends who knew and loved her, it was impossible to think that this alert, overflowing mind, this dynamic personality really had been withdrawn from their circle. One must think that she has been summoned to a greater work, that she is carrying on in a high sphere. One likes to think that, in spirit, she is here, inspiring and guiding those with hearts open to receive and with ears attuned to hear. "Lampadia echontes diadosousin allelois" from Plato's Republic was one of Miss Drew's favorite quotations, a rather liberal translation of which is, "and having torches, while running, they pass them one to another." Reams could be quoted here from the dozens of telegrams, letters, and testimonials received from the great and the less great after her death.

On December 20, 1930 a Memorial Service in Miss Drew's honor was arranged by Miss Catherine Van Rensselaer, who introduced the many speakers present to pay tribute to Miss Drew. One of the members of the Alumni Association of the school composed and read the following:

> She has laid down to rest — yet lives
> Unhampered by Life's odds,
> Going on in service from strength to strength
> In that glorious Kingdom of God's.

On January 26, 1931, Miss Emily I. Case, chairman of the department of Hygiene and Physical Education at Gingling College, Nanking, China wrote to ask permission to make use of material in Miss Drew's book, "Adapted Group Gymnastics," for translation into Chinese in a book to be called, "A Manual of Physical Education Activities for Primary and Junior High Schools." Miss Case stated that they had used the book for years, both in their regular corrective classes and with their normal students. Permission was granted cheerfully as Miss Drew would have done had the request been received before her death.

Miss Drew is buried in Grove Hill Cemetery, Waltham, Massachusetts, in her family plot. A bronze grave marker reads:

LILLIAN CURTIS DREW
PIONEER, TEACHER, AUTHOR
IN THE FIELD OF
INDIVIDUAL GYMNASTICS
BOSTON AND NEW YORK
DIED 1930

This biography contributed by a personal friend,
ISABEL SUTHERLAND COOPER

Miss C. M. K. Applebee

A Sketch of Forty Years of Service

ON UPPER REGENT STREET in London there is a large brown stone building. There a young English teacher faced a group of milling, squirming London urchins. Out of confusion, she brought order. It was part of her practical examination for the British College of Physical Education diploma. Her handling of that problem, discipline, was basically characteristic. Her classes were so full of amusing activity that there was no inclination on the part of her students to cause any disturbance, and no time to carry it out if the inclination existed. Once in a long while the problem did crop up; I suppose it was over-abundant energy on the part of the class. I remember when my class at Bryn Mawr did the bunny-hop in deep kneebend position until we were well exercised and everyone had had a chance to laugh at the antics of everyone else. The most acute problem in discipline arose in a Y.W.C.A. class of workers from a factory. Many experiments had not met with much success. Passing the office on her way to class one evening, Miss Applebee said, "Don't mind anything you may hear in the gymnasium to-night." Then she went in to her class and greeted them, "Come now, I want all to take hands and run as fast as you can to the other end of the gym, shouting as loud as you can!" Having arrived at the other end with the class, she repeated the procedure until all the extra breath had been used up, and everyone was ready to enjoy the formal work of the class.

Miss Applebee's first introduction to American Physical Education was at an International Educational Exhibit held in London, where a section was given to a demonstration of Dr. Dudley Sargent's system and research work in physical measurements. As a result of seeing this exhibit she came to America to attend a session of the Harvard Summer School under Dr. Sargent in 1901. Work with him must have deepened her conviction that the essential thing in physical education was to give young people the deep satisfaction, the real joy of doing physical things well, of having a body capable of doing what was asked of it.

It was during this summer session that Miss Applebee first demonstrated what field hockey consisted of. Miss Harriet Ballintine, Physical Director at Vassar College, was also taking the summer course, and asked Miss Applebee if she played the game and if she would give a demonstration. The group went out into the courtyard behind the gymnasium armed with wands and a dumbbell, learned the formations of a team and the general idea of the game. After this, Miss Ballintine asked Miss Applebee to remain in the United States for the opening of Vassar, when she could teach the game to the students there. It was dis-

covered that A. G. Spalding's store in New York had twenty-two hockey sticks and a cricket ball which had been imported from England when a group of Englishmen living on Staten Island had tried to start the game. Then the coaching at Vassar began and the students were so enthusiastic that Miss Ballintine wrote to the directors in the other Eastern colleges and suggested that they also should ask Miss Applebee to introduce the game. So, carrying her supply of sticks with her, she brought the game to Bryn Mawr, Vassar, Wellesley, Smith, Mount Holyoke, and Radcliffe. Thus traveling up and down the country, leaving growing interest and enthusiasm everywhere she went, she gave the game its first foundations in America. An item of real importance was that the rules were kept stable and were published by Spalding's American Sports Publishing Co. from the very beginning until 1938, when all the rule books for women's games were turned over to A. S. Barnes and Co.

However she traveled only three autumns because President Thomas decided that Bryn Mawr must have the benefit of all her time and energy. In 1904 she became Director of Athletics at the college, and in 1905 took over the gymnastics as well as the athletics. Under her, and with a four year requirement of physical training, an amazing percentage of the students at Bryn Mawr took part in athletics of some kind. During the hockey season there were twenty-five class teams, and in the basketball season fifty teams played inter-class competitive games. Hockey, basketball, waterpolo, and track were major sports; but there were also tennis, swimming, fencing, archery, and badminton.

No account of Miss Applebee's years at Bryn Mawr would be complete without an appreciation, however inadequate, of her influence for high standards of sportsmanship among the students. They played, from the 'varsity to the lowest class team, with all their heart. To well deserved victory or to defeat, each team fought to the last goal, played to the last whistle, and found satisfaction in having done their best. The team that had played its best could depend on Miss Applebee's praise regardless of the result of the game. Here "play for play's sake" did not disregard the vital fact that we play games to test our strength and skill against the strength and skill of others. Fairness was taken for granted, but the administration of it, as exemplified in umpiring, was a matter of the strictest training and standards. Every inter-class game was not only refereed by Miss Applebee, or another instructor, but was umpired by four students, the captains and managers of the two classes not playing in the match; the first team captains and managers for a first team match, the second team captains and managers for a second team match, and so on all down the line. Three whistles on every foul was the rule, and woe to the umpire whose whistle was silent when those of the other two officials sounded.

For several of Bryn Mawr's Elizabethan May Day Pageants Miss

Applebee was responsible for training all the Morris and Country dancers. One year she was Director of May Day, when she was not only in charge of the dancing, but was director of all the general work of putting on the plays, involving among other things, the making of hundreds of historically authentic costumes.

In 1910 one of the earliest college health departments was established at Bryn Mawr. Working in the closest cooperation with the college doctor, the Department of Athletics and Gymnastics kept a check on the health of the students, not only in relation to their sports and gymnastics, but also in relation to their academic work.

She was vitally interested in all student activities and actively helped in the organization of several. In 1915 a group of students, with her help, started the "College News," and she remained as adviser for the paper until 1920 when it was firmly established and its policies had been crystalized. She also gave much time and thought to helping with the religious work of the students. There were, at one time, two religious organizations on the campus. Their rivalry worked against the best interests of both, and it was largely due to Miss Applebee's influence with both groups that they were disbanded and a united Christian Association was organized.

While at Bryn Mawr Miss Applebee started publishing The Sportswoman, a magazine devoted entirely to sports for women and girls. The magazine was a real force in the development of wider interest in women's sports. It reached not only the students in school and college, but also the graduates who were continuing their games in club activities. Thus it gave each group a clearer understanding of what the others were doing in sports. The magazine fell into difficult days when Miss Applebee found it impossible to direct its policies and publication personally, and it has since been discontinued.

In 1922 she helped to organize the United States Field Hockey Association which has always fostered the highest standards of competition and sportsmanship among hockey players. Through all the years following its formation, the Association has had Miss Applebee's interest and support. In countless ways she has helped those who wished to play better hockey. Perhaps in no way has she done so much, as in her work of organizing and directing the September Hockey and Lacrosse Camp at Mount Poco o. The camp was started in 1922 and will have its twentieth season this autumn. There under Miss Applebee and her assistant coaches, many of whom she brought from England to help with the camp, hundreds of physical education teachers and thousands of school, college, and club players have had a unique experience. For sessions of one or two weeks, they have studied and discussed, played and lived hockey; morning, noon, and night. It is hard to describe, for those who have never experienced it, Miss Applebee's genius as a hockey coach. She can take twenty-two players who have literally never seen

a game or a stick. She can teach the rudiments of skill in hitting and stopping the ball, and the fundamentals of how a team works to score goals; and in less than half an hour she has her players playing hockey! Confusion there is bound to be, but everyone learns immediately to stop dead at the sound of the whistle, and while the players who have crowded around the ball are being sorted out and sent to their proper places on the field everyone learns her relationship to everyone else. But still it is a real game, and not a class. More work on ball control is slipped in here and there, but only as the need of it is apparent to the players. Nothing seems a greater waste of time to Miss Applebee than hours spent on "skills," none of which are made use of when the real game starts. It is impossible to be coached by Miss Applebee without being stimulated to do one's best, without leaving the field wanting to play more and better hockey.

After 1929 Miss Applebee's time was increasingly given to the care of Miss Mary Warren Taylor, whose health was failing and who died in December, 1936. I can think of no more perfect embodiment of loyalty and devotion than was expressed in the lives of Miss Taylor and Miss Applebee. Miss Taylor came to Bryn Mawr in 1905 and held the position of Secretary to the Department of Athletics and Gymnastics throughout Miss Applebee's years as director. Her gracious influence was felt by countless students both at Bryn Mawr and at Hockey Camp. The memory of her presiding over tea on Sunday afternoons at Bryn Mawr will live as long as there is one of us left who was fortunate enough to be welcomed by her there.

Miss Applebee's latest undertaking has just been brought to a most successful conclusion. In the early autumn of 1940 she suggested that all American hockey players, past and present, should be given the opportunity to contribute to a fund for an ambulance to be sent to England by The British American Ambulance Corps. The U.S.F.H.A. cooperated in this work, but the success was due entirely to Miss Applebee's work and enthusiasm and generosity. Individuals, clubs, and local associations of the U.S.F.H.A. contributed; and outstanding gifts were made by schools and colleges. The fund resulted in the gift of two regular ambulances and one desert ambulance, as an expression of our friendship and admiration for our English hockey friends.

Forty years overflowing with work and accomplishment give promise of more to be accomplished, of more days filled with devoted service for other people.

Contributed by CYNTHIA WESSON

Abby Shaw Mayhew

AFTER graduating from Wellesley College, receiving a degree from the Sargent Normal School of Physical Education in Boston, directing the physical work at the Y.W.C.A. in Minneapolis, and serving as physical director at the University of Wisconsin, Abby Shaw Mayhew started pioneering down new trails and the new trails led to the Orient. In 1912 she sailed for China.

In 1912 the young Chinese Y.W.C.A. was also pioneering and its national committee, looking toward increasing Chinese leadership, was laying its plans accordingly. It had two major concerns; ways of working directly with girls and women in China and ways of training Chinese leaders. Health education and recreation were at that time new fields of interest for women and to them the national committee gave its early consideration. Abby Mayhew was asked to join the Y.W.C.A. staff in China, to study the need and work out a program for physical education for the Chinese Y.W.C.A. The result was the Normal School of Physical Education and Hygiene of the Y.W.C.A. in China, opened in Shanghai in 1915, offering a two-year course, and headed by Abby Mayhew. It took three years to get the school established and the first class was graduated in 1918. The school was a definite piece of pioneer work as no other organization was answering the request of Chinese students for such training and it fitted easily into the program of the Y.W.C.A. as it was training young Chinese women to be teachers of their own people. Of the first commencement in June, 1918, Abby Mayhew wrote: "Six young women were graduated with appropriate exercises. So many people wished to attend that most of the program was repeated to another enthusiastic group the next day. Besides drilling and exercising, the school presented the health play 'Swat the Fly.' The crowning moment came when the girls marched into the center of the room, in their new white middies and neat black silk bloomers, standing erect and having an ease and grace of movement I had hardly dared hope for. They stood in front of Miss Chun and myself as we gave them our parting words and presented them with certificates. As they bowed and marched out of the room I realized that our very first class had gone out to serve the cause of health and physical freedom — the class that may be talked of fifty years from now as the pioneer class, the class that started the whole movement of physical education in this vast China."

The principal of a girl's school in Kiangsu Province wrote at once: "We must have a girl in your school. I have picked out four. If the first does not suit, we want you to see the others. I want you to have our best." And from a friend visiting from America: "The school

seems to me one of the most successful, promising, and fruitful developments of the work in China. Not only will its graduates fill positions in Y.W.C.A.'s as they have more equipment for physical work, but they are in increasing demand for mission and government schools."

The next year brought more pioneering. The school had prospered to the point of needing a building of its own. Suitable property was found in a suburb of Shanghai and in the fall of 1919 the good news was announced. "At last we have a home for our school! We are so very happy! The grounds cover eighteen mu of land, divided almost evenly by a private road. On one side there is a residence and a beautiful garden; on the other will be the school buildings, tennis courts, and an athletic field. The girls are so happy to know there is to be more than one tennis court. Our thirty-five girls have had difficulty in getting in very much tennis practice with only one court. . . . Our dream of the future sees these girls going out into the large government schools, mission schools, and Y.W.C.A.'s—going out as Christian teachers to give knowledge of physical and spiritual regeneration to thousands of girls and women who in time will be wives and mothers and leaders of a new China." The new building was dedicated in January, 1920, and the dedication address, as announced in the program, was given by "Miss Pendleton, Wellesley College, U.S.A." All this was very new and exciting for the girls of China.

Another epochal year for the school was 1924. It was on the move again, this time to Ginling College, another dream which had come true. In the same year that Abby Mayhew's school was opened, another piece of pioneer work was going on up the Yangtze River. Ginling College, "little sister of Smith College," had been opened at Nanking and a full four-year college course was now being offered to Chinese girls. Two years of training in physical education, without college training, was proving hardly adequate professionally, but no college offered a major in physical education and hygiene. Should the Y.W.C.A. and Ginling College merge their interests so that the graduates in physical education would also have college degrees? In the end it was so decided and the Normal School of Physical Education and Hygiene of the Y.W.C.A. became the Department of Health Education and Recreation of Ginling College. The two-year course became part of a full four-year course, and the opportunity to help in the developing of playgrounds, health and recreation centers, and health programs for new China seemed unlimited. This was in June, 1924. "I addressed the last class as I had the first," Abby wrote as this chapter of her pioneering closed. Fifty girls had been trained and were working in important posts throughout China.

In 1930 along came another letter: "The first national athletic meet held in China is on for ten days at Hangchow and there are twenty of my graduates taking part. They have asked me to come

down and are having a dinner for me there. . . . I went! Twenty-six graduates of our school had brought 120 of their students to take part in the events. In all there were 2,000 participants. Of these, 200 were girls and of the 200 we were responsible for 120! The only women officials in the meet were the two girls we had sent to America for further study." The implications of all this were not missed by the press. The *North China Daily News*, in an editorial captioned "Reunion in Hangchow," paid its tribute to Abby Mayhew. "It is perhaps not given to everyone to have such an experience, revealing the value of work done in past years."

Back in 1924 a new trail had opened for Abby Mayhew and we see her not as the head of a school, but as the beloved first lady in the Y.W.C.A. Hostess House in Shanghai. The Y.W.C.A. was experimenting again, this time in new ways of interpreting its work through acquaintance with Chinese people. Visitors to China were to see not only the outside, but the inside of life as it was lived, learning to understand and appreciate it through meeting Chinese men and women. Again the national committee turned to Abby Mayhew. Would she bring her experience and her skills to this new piece of work? She would, and the pioneer spirit and gracious personality which had made possible the physical education school was now transferred to the Hostess House. Again the press took note and subscribers to the *China Press* read, "Women travelers are special charges of the Y.W.C.A. Hospitality centers in the Far East make globe-trotting for ladies safe and sane." Abby Mayhew saw to it that for lady globe-trotters and their escorts, days spent in Shanghai were not only safe and sane, but that they contributed, each in its own way, to an understanding of China and an intelligent appreciation of its beauty, its problems, and its needs. There were always interesting Chinese people about the Hostess House.

In itself, the Shanghai Hostess House was a charming, if rather dilapidated, building overlooking the gardens of the British Consulate and the busy river traffic of the Whang Poo in the distance. Probably no telephone in Shanghai rang more often than Abby Mayhew's and no guest book had more interesting signatures. And by no one, outside of a travel agency, were more boats met as they nosed their way up the river to the Shanghai jetty. Every boat brought visitors and every mail brought word of more to come. They came from everywhere—Y.W.C.A. secretaries and guests, government officials, diplomats, business men and women, college presidents, teachers, preachers, missionaries, writers, friends, friends of friends, and tourists. Abby Mayhew's name was known to an amazing number of people and she herself was ever a gracious and kindly interpreter of East to West and West to East as she met her guests and sent them on their way. To many bewildered travelers the Hostess House was a welcome bit of home at

the gateway to the Orient and from its friendly security they set forth on less familiar paths to the inland cities.

The last few years have seen many changes in China and in the Y.W.C.A. in China, but to Chinese and Westerners alike, the Hostess House remains a symbol of international friendliness and good will and the name of Abby Mayhew recalls the happiest of memories. A grateful guest once wrote "You have turned what might have been a little cinema show into an epoch. I have more realization of China after those few hours in your home than a library of books could have told me, or made me feel." And of those days Abby Mayhew herself wrote, "I am living another of my dreams, in living in a House of Friendliness, as one of our guests puts it, or as I like to think of it, living in a house by the side of the road — and that such a busy road in the most interesting land I know."

In October, 1930, an important ship sailed from the Orient and on it there was an important passenger. As she sailed, Abby wrote "At last the time has come when I am to turn my face eastward and sail and sail until my feet touch the soil of my native country. We sail on the Empress of Canada November 2 and arrive in Vancouver on the 14th — just twelve days to cross the Pacific. The shortest time in which I have ever made it before was fifteen days, so this seems almost like flying."

Since then many miles of America have been covered and many trips taken from her Minnesota home, including her fiftieth reunion at Wellesley in 1935. Since then, too, great things have happened in China. When we know of the ever-increasing interest in health, physical education, recreation, and welfare and know how much of the responsibility of it is carried today by Chinese women, friends of Abby Mayhew think back with deepening appreciation to the summer of 1918 when that pioneer class of six went out from her school, certificate in hand, to take their part in the rebuilding of China. It is not given to everyone to watch the flowering of seeds that have been planted.

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